LAUREA
UNIVERSITY OF APPLIED SCIENCES
Together we are stronger

Economic preferences explaining physical activity stages of change

Laura Vainio

Laurea University of Applied Sciences

Economic preferences explaining physical activity stages of change

Laura Vainio
Behavioural Insights in Business Applications
Master's Thesis
October, 2019

Laurea University of Applied Sciences
Behavioural Insights in Business Applications
Master's Thesis

Laura Vainio

Abstract

Economic preferences explaining physical activity stages of change

Year 2019 Pages 76

Majority of the world population fail to meet with weekly physical activity guidelines, even if adequate amount of physical activity has been proved to prevent various diseases and improve one's mental ability. International physical activity guidelines are rather reasonable demands between a minimum of three hours and fifteen minutes to four hours and thirty minutes on a weekly basis, based on the type of activity. Alas, depending on the studies and target groups, the inactive population is as high as 66-80 percent, and this untoward fact applies to all age groups.

Nonetheless, there are people who habitually excel at meeting the guidelines. The key question is how their attributes and behaviour differ from the inactive individuals'. Earlier literature and research have suggested that one underlying factor would be individuals' approaches to risk and time. Moreover, researching risk- and time-related cognitive biases might be one way of understanding habitual physical activity. Until today, there are few studies and varying results among this research area. This perspective was taken to a closer examination as the research scope: how individuals' economic preferences explain their physical activity. The indicator for physical activity was the stages of change model, that gives a stepwise outlook on how routinized and established one's physical activity currently is.

The research method was a cross-sectional case study. The study took part in a Finnish case organization, whose employees work indoors at office facilities. Subjects were studied via an online survey. Firstly, individuals' risk and time preferences were studied from the financial point of view by creating hypothetical situations of receiving money. These situations were a gamble with risk-aversive, risk-neutral, and risk-seeking options, and receiving money either now or after six months with a varying interest. Secondly, subjects answered statements considering physical activity to find out whether there underlay risk- or time-related cognitive biases: status quo bias, habit, loss aversion, intertemporal choice, and licensing effect.

The data-analysing methods were ordinal logistic regression and multiple linear regression. Both methods resulted statistically significant causalities with three variables: age, status quo bias, and habit. This result was verified and refined in a structural equation model. Financial risk and time preferences and other background variables did not have statistically significant causalities. Neither did the other three cognitive biases under closer examination.

The research objective was to build a model that have a causal effect on case company employees' physical activity stages of change. Suggestions based on this study result is to focus especially on the younger employees by initializing and incentivizing sustainable physical activity habits starting from the worksite, which might spread from work to other areas of life too. Further research was encouraged to set in motion, especially in the form of test-retest and a randomized controlled test with real financial incentives.

Keywords: economic preference, risk, time, physical activity, stages of change model

Laurea ammattikorkeakoulu **Tiivistelmä**
Päätöksenteon ilmiöt johtamisessa, kehittämisessä ja asiakastyössä
Tradenomi (ylempi AMK)

Laura Vainio

Economic preferences explaining physical activity stages of change

Year 2019 Pages 76

Enemmistö maailman väestöstä ei tavoita viikoittaisia terveysliikkumissuosituksia, vaikka riittävän määrän fyysistä aktiivisuutta tiedetään ennaltaehkäisevän lukuisia sairauksia ja parantavan yksilöiden henkisiä kyvykkyyksiä. Kansanväliset liikkumissuositukset ovat melko kohtuullisia; viikkotason minimivaatimus vaihtelee kolmen tunnin viidentoista minuutin ja neljän ja puolen tunnin välillä riippuen fyysisen aktiivisuuden luonteesta. Tutkimustulokset ja kohderyhmät antavat hieman erilaisia tuloksia, mutta liian vähän liikkuvia on väestössä valitettavat 66-80 prosenttia, ja tämä ikävä tosiseikka pätee kaikkiin ikäryhmiin.

Siitä huolimatta on ihmisiä, jotka tavanomaisesti onnistuvat saavuttamaan suositukset. Oleellista onkin kysyä, miten heidän ominaisuutensa ja käyttäytymisensä eroavat liikkumattomista yksilöistä. Kirjallisuus ja aiemmat tutkimukset ovat ehdottaneet piileviksi tekijöiksi yksilöiden taloudellisia painotuksia sekä riskiin ja aikaan liittyviä kognitiivisia vinoumia. Tähän päivään mennessä on joitakin tutkimuksia ja vaihtelevia tuloksia tällä tutkimuksen saralla. Edellä mainittu näkökulma otettiinkin tarkempaan tarkasteluun tutkimuksen tavoitteeksi: miten yksilöiden lähestymistavat riskiin ja aikaan selittävät heidän fyysistä aktiivisuuttaan. Fyysisen aktiivisuuden indikaattori oli muutosvaihemalli, joka antaa vaiheittaisen näkymän yksilön rutiiniksi muodostuneeseen ja vakiintuneeseen senhetkiseen fyysiseen aktiivisuuteen.

Tutkimusmenetelmä oli poikkileikkaava tapaustutkimus. Tutkimus tehtiin suomalaisessa case-yrityksessä, jonka työntekijät työskentelevät toimistotiloissa sisällä. Koehenkilöitä tutkittiin online-kyselylomakkeella. Ensin henkilökohtaisia riski- ja aikapainotuksia tutkittiin taloudellisesta näkökulmasta, jossa hypoteettisissa tilanteissa annetiin rahaa. Näitä tilanteita olivat uhkapeli, jossa oli riskiä kaihtavia, riskineutraaleja ja riskihakuisia vaihtoehtoja, sekä rahan vastaanottamistilanne, jossa annettiin rahaa joko nyt tai puolen vuoden päästä erilaisilla koroilla. Toiseksi koehenkilöt vastasivat liikkumista koskeviin väittämiin. Tällä selvitettiin, oliko taustalla riskiin tai aikaan liittyviä kognitiivisia vinoumia: vallitsevan olotilan harha, tavanmukaisuus, tappiokammo, intertemporaalinen valinta ja lisensointivaikutus.

Aineiston analyysimenetelmät olivat logistinen regressio ja lineaarinen monimuuttujaregressio. Molemmat menetelmät löysivät tilastollisesti merkitsevät tulokset kolmesta muuttujasta: ikä, vallitseva olotila ja tavanmukaisuus. Tulokset todennettiin ja paranneltiin rakenneyhtälömallilla. Taloudelliset riski- ja aikapainotukset ja muut taustamuuttujat eivät selittäneet liikkumista tilastollisesti merkitsevästi - myöskään eivät muut kolme kognitiivista vinoumaa.

Tutkimuksen tarkoitus oli tuottaa mali, joka selittää case-yrityksen työntekijöiden fyysistä aktiivisuuden muutosvaihemallia kausaalisesti. Tutkimuksen perusteella voidaan ehdottaa, että aloitteiden tulisi keskittyä erityisesti nuoriin työntekijöihin. Kestäviin liikkumisen tapoihin tulisi löytää kannustumia, jotta työpaikalla aloitetut hyvät tavat leviäisivät muille elämän osa-alueille. Lisätutkimukset aiheesta ovat toivottavia, erityisesti säännöllisen uudelleentestauksen ja taloudellisesti kannustettujen, satunnaistettujen vertailukokeiden muodossa.

Avainsanat: taloudellinen painotus, aika, riski, fyysinen aktiivisuus, muutosvaihemalli

Table of Contents

1 Introduction on economic preferences and physical activity stages of change

Physical activity (PA) must have been studied countless times by the time this thesis is published, and the topic keeps on being current. This is due to a constant failure of majority of adult population meeting the physical activity guidelines (World Health Organization 2018; U.S. Department of Health and Human Services 2018; Husu et al. 2018), and unfortunately, even majority of the adolescents (Kokko, Mehtälä, Villberg, Ng & Hämylä 2016; Husu, Jussila, Tokola, Vähä-Ypyä & Vasankari 2016). The situation exists despite that adequate amount of physical activity decreases the risk of both cardiovascular diseases, cancer, and diabetes (World Health Organization 2018), and anxiety and depression (U.S. Department of Health and Human Services 2018). Furthermore, meeting physical activity guidelines assists in weight control (World Health Health Organization 2018), improves self-reported mental health (Chekroud et al. 2018), and supports better cognitive functions, sleeping, and better quality of life (U.S. Department of Health and Human Services 2018).

Guidelines accomplishing adequate amount of physical activity are reasonable, so to speak. The UKK Institute (2018), the World Health Organization (2018) and the U.S. Department of Health and Human Services (2018) consider the following recommendations to be met for adults between 18 and 65 years: either moderate activity for two hours and thirty minutes or vigorous activity for one hour and fifteen minutes throughout a week. Besides, muscular endurance and motor skills supporting physical activity should be conducted minimum twice a week. (UKK Institute 2018; World Health Organization 2018; U.S. Department of Health and Human Services 2018.) Despite a rather low weekly threshold, the recommendations aren't met. This study wanted to understand, why is that so.

"…keep calculating, keep weighing. What exactly do I gain, or lose?" (Gros 2014, 73). This is how Gros (2014) described Henry David Thoreau's thoughts on using any individual's valuable time. Leonard and Shuval (2017) and Conell-Price and Jamison (2015) both comment that engaging in sufficient amount of physical activity is a cost-benefit choice individual needs to make each time: albeit the proof of immediate relief exercise can bring, individual will still weigh on the fact, if there's enough or any long-term benefits of being active. Leonard and Shuval (2017) continue that most of the benefits might occur somewhere in the future, and there is no certainty. There is also a prevailing risk aspect: what might individual lose in exchange dedicating time for physical activity? (Leonard & Shuval 2017.) The wins gained from physical activity might not cover the immediate losses that for certain are experienced, i.e. lost time and exhaustion (Leonard & Shuval 2017) and the possibility of losing an activity that would be certainly enjoyable (Tversky & Kahneman 1991).

Economic preferences in this study are restricted to individual risk and time preferences that have been studied rather thoroughly lately (i.e. Leonard et al. 2013; Conell-Price & Jamison

2015; Israel, Rosenboim & Shavit 2014). Risk-seeking behaviour has been connected with smoking (Anderson & Mellor 2008; Coppola 2014; Conell-Price & Jamison 2015), unprotected sex and alcohol abuse (Conell-Price & Jamison 2015), but also with increased physical activity (Coppola 2014; Leonard et al. 2013). Moreover, risk aversion has been linked to exercising, flossing, decreasing Body Mass Index (BMI), and eating healthy food (Conell-Price & Jamison 2015). Time preferences have been connected with physical activity and healthier lifestyle. Higher patience predicted more physical activity (Leonard et al. 2013; Shuval et al. 2017; Shuval, Si, Nguyen & Leonard 2015; Kosteas 2015). Then again, impatience has been connected with obesity (Komlos, Smith & Bogin 2004; Zhang & Rashad 2008; Golsteyn, Grönqvist & Lindahl 2014), obesity of subjects' children (Stoklosa et al. 2018), higher BMI (Smith, Bogin & Bishai 2005; Zhang & Rashad 2008), even exercise (Conell-Price & Jamison 2015), and smoking (Miura 2019; cf. Anderson & Mellor 2008; Khwaja, Silverman & Sloan 2006).

Earlier research supports the link between economic preferences and leading a healthier lifestyle. Leonard and Shuval (2017) have suggested that risk and time preferences are one of the most important factors that should be considered when going into details of physical activity behaviour. This study responded to the suggestion by setting up a similar financial incentive question setup as in Leonard et al. (2013). Additionally, Leonard and Shuval (2017) have proposed that the following cognitive biases might have influence in a person’s physical activity: status quo bias (SQ), habit (H), and loss aversion (LA) have been connected with risk, whereas intertemporal choice (IC) and licensing effect (LE) with time preferences. This study took these cognitive biases for a closer scrutiny via statements on physical activity.

Status quo is a condition, where individual tries to prevail the current state instead of making changes because these changes feel and might be more uncertain (Cocina 2014; Samuelson & Zeckhauser 1988). Habit connects closely with status quo bias by being a practiced routine in individual's life (Gardner, Lally & Wardle 2012; Wood & Neal 2009). Habits are also rather sticky (Wood & Neal 2009). Thereby, a key question could be, whether individual has embraced mostly healthy or unhealthy habits, and how to move towards the healthier ones. Tversky and Kahneman (1991) describe loss aversion as a state, where individual weighs on decisions based on the possible gains and losses of the outcomes. Hurt of a single loss is greater than pleasure of gaining the same thing. (Tversky & Kahneman 1991.) Hence, conducting physical activity might be viewed as a potential immediate loss instead of gaining something good in the long term (Leonard & Shuval 2017).

With time-related cognitive biases, Milkman, Rogers, and Bazerman (2008) characterize intertemporal choice as a want-should conflict, whereas Sniehotta, Scholz, and Schwarzer (2005) use the term intention-behaviour gap. Individuals tend to choose what they want—instead of what they should. Additionally, their intentions might be more noble than concrete behav-

iour. (Milkman et al. 2008; Sniehotta et al. 2005.) Intertemporal choice has been hypothesized to influence in the physical activity domain too (Leonard & Shuval 2017). Then again, licensing effect comes into the picture after individual has already conducted a good choice (Milkman et al. 2008; Monin & Miller 2001). A good choice or portraying oneself as a good person in general self-licenses individual to act on guilty pleasures subsequently (Khan & Dhar 2006). This kind of compensating behaviour has been identified to some extent in studies concerning the health domain (Prinsen, Evers & de Ridder 2019; Rosenkilde et al. 2012).

Physical activity was examined through Prochaska and DiClemente (1983) stages of change model that categorizes a person's physical activity into five stages: precontemplation, contemplation, consideration, action, and maintenance stages. Activity is at its lowest level in the precontemplation stage and at its highest in the maintenance stage, and the order is systematically ascending. (Prochaska & DiClemente 1983.) The stages of change model has been used originally in the smoking cessation context (Prochaska & DiClemente 1983; DiClemente et al. 1991), but it has been expanded to health context too (Marcus, Rossi, Selby, Niaura & Abrams 1992; Dumith, Gigante & Domingues 2007; Garber, Allsworth, Marcus, Hesser & Lapane 2008; Leonard et al. 2013).

This was a cross-sectional case study on individuals' economic preferences explaining their physical activity behaviour. Subjects were employees of a case company, and they were surveyed online in June 2018. The study was conducted as complete enumeration from a total population of 165 with a nonresponse of 13 % (N=144). The survey consisted of background variables, questions considering overall perceived health, hypothetical financially incentivized questions based on Leonard et al. (2013), and statements on cognitive biases that might connect with physical activity as Leonard and Shuval (2017) suggest.

Most of the subjects were male (63 %). Subjects were between 18 and 55 years old, but rather young people. Mean age was 26.0 (SD=7.8), median age was 23.0 and mode age 21.0. Highest level of degree was high school or vocational school for majority of respondents (68 %). Only 16 % reported a higher educational status. Majority of the subjects were categorized in the pre-obesity class BMI (25.9, SD=5.7). Despite the possible overweight, most subjects perceived their health status rather good (49 %) or particularly good (27 %). Most-reported daily sedentary behaviours were between four and six hours (49 %) and two to four hours (36 %), which were less than the Finnish average (Husu et al. 2018). Median reply for the variable PASC (Physical Activity Stages of Change) was preparation phase. Subjects were divided to risk-seeking (38 %), in-betweens (36 %), and risk-aversive (26 %). Moreover, they were categorized as future-biased (71 %), time consistent (26 %), and present-biased (4 %).

The survey data were analysed through two separate regression models: ordinal logistic regression (OLR) and multiple linear regression (MLR). OLR was used by Leonard et al. (2013),

and the method is designed for ordinal data as in this study. MLR was used as a comparing method. There are other studies, too, that have used both methods (i.e. Bezyak, Berven & Chan 2011). A structural equation model (SME) was built for finalizing the data analysis from the variables that determined the dependent variable PASC on a significance level of $p<0.05$. The final model was presented to the case company for finding tools for engaging in physical activity. The case company leadership was encouraging their employees to answer the survey during the research process. They were committed to find sustainable means for engaging in physical activity as a part of this development case.

There are a few limitations considering the research. Firstly, generalizations of the study can be made to the whole population with some considerations. The relation between complete enumeration and statistically significant results reported in p-values should be considered along the study. Even if statistical significance doesn't necessarily refer to statistical likelihoods in this context when the whole population is under close examination, it should be taken as a recommendation on the direction (Dayton 2014) or a sort of a confidence interval (K. Jones 2014). This type of non-identical but comparable setup has been used earlier by i.e. Golsteyn et al. (2014). The research setting was correlative meaning that there wasn't any conducted experiment with a control group. Therefore, one shouldn't generate too strong conclusions on causality, since the test result lays on observations only (Nummenmaa 2009).

Secondly, main data were survey-based and therefore self-reported. Self-reporting can be seen as a limitation in comparison to more objective measures and field testing. There has been even observed significant differences between self-reported and objective measures with the former giving more optimistic evaluations (Husu et al. 2018). Still, there exists a practice self-reporting (i.e. Plotnikoff, Lippke, Johnson & Courneya 2010; Conell-Price & Jamison 2015). The challenging part is that the information is retrieved from the individual memory, and especially if the study target is lacking a strong, even documented habit for the observed behaviour, counting on memory isn't a strong evidence (Pahkinen 2012). M. Jones (2014) adds up that a respondent might not answer honestly. Leonard and Shuval (2017) synthetize that subjects might overestimate their results when self-reporting in comparison to i.e. pedometers but agree that even large studies rely on self-reported data. Thirdly, Likert-statements such as perceived health that had a 5-point scale from particularly poor to particularly good might be understood very subjectively without a proper consensus of the definition (Pahkinen 2012). One survey cannot mediate in between many possible definitions, unless elongating the survey length is a possibility. This could have been possible only, if the survey would have been drastically shorter including only a handful of questions. Reliability is one way of validating these types of questions, but no single measurement can truly place the subjects on an identical understanding.

Fourthly, economic preferences are measured through numerous mediums instead of a single procedure. For example, risk preferences are found to be domain-specific (Coppola 2014). This could decrease the value of general lotteries versus a specific research domain. Conell-Price and Jamison (2015) in turn reflected on the sensitivity of measuring time preferences. A statistically insignificant result could lead from too a sensitive time preference measure also. On the other hand, the statements on individual biases in this survey were supposed to integrate either risk or time in the physical activity context. Komlos et al. (2004) note that a common problem in hypothetical surveys is "the difficulty of distinguishing time preference from the interest rate and risk preferences" (Komlos et al. 2004, 213). They argue that future options might be designed risky by accident, and this could lead to subject choosing the present option. One should be also aware of interest rates and understand, what kind of minimum expected return is realistic in the future option. This might require a basic-level knowledge on economics, which may not be a foregone conclusion. (Komlos et al. 2004.)

Fifthly, as Agresti (2012) reflects on choosing the right data analysis method, the fact that there were many independent variables might weaken the actual method. This is valid especially, if the variables confront multicollinearity: too many correlations that falsely imply none of the variables is important. Multicollinearity might create problems in the parameter estimate too (UCLA 2019b). If the problem is collinearity only, that might still be just a light burden: it won't violate the parameter estimates—rather, it just makes the estimates inaccurate (Ketokivi 2015). Another viewpoint for having many independent variables is that they improve the reliability (Tavakol & Dennick 2011; Nummenmaa 2009).

Finally, this study took place in a white-collar, desktop work case company in Finland, whereas Leonard et al. (2013) study dived into a low-income African-American community. The two studies were not identical copies, and some adjustments were needed to fit in the Finnish organizational environment. As described in the Research part in detail, changes were made i.e. in the background questions, questions considering overall activity behaviour, and variables that built the PASC variable. Subjects were not given any money either. Another distinguishing factor was the statements on risk- and time-related cognitive biases. This way, something new would be created in the research value chain.

The sample was gathered as cross-section in June 2018, and one can only interpret results retrospectively. The model that bases on physical activity among employees represents therefore only an era and cannot be viewed as a fundament of anything. Rather, the model and all results should be understood as direction indicators. All along, one overall purpose of this study was creating a theoretical and empirical baseline for further research—especially for further field testing. All this doesn't diminish the value of this study, because this can be a steppingstone for further research in the case company but also as a continuum for previous studies on risk and time in the physical activity domain.

2 Physical activity is a cost-benefit decision of uncertain, intertemporal outcomes

This section connects economic preferences with physical activity and the stages of change model through existing literature. Risk and time preferences are defined, and experimental designs on both economic preferences are reviewed. Also, a possible connection between a few selected cognitive biases and physical activity is speculated. Physical activity is defined, too, and the existing evidence on the importance of being physically active is reviewed.

2.1 Physical activity is the key, yet physical inactivity is the normal

This study follows the line of the World Health Organization (2018) by defining the term physical activity to cover all types of activities an individual carries out regularly, instead of pure exercise. As the U.S. Department of Health and Human Services (2018) point out, "although all exercise is physical activity, not all physical activity is exercise" (U.S. Department of Health and Human Services 2018, 29). The UKK Institute (2018) recommends either moderate activity, i.e. walking or cycling, for two hours and thirty minutes, or vigorous activity, i.e. running or aerobics, for one hour and fifteen minutes each week. Either form or a combination of these afore-mentioned activities should also be supplemented with muscular endurance and motor skills supporting physical activity i.e. strength training or ballgames at least twice a week. (UKK Institute 2018; World Health Organization 2018; Husu et al. 2018.) To gain additional health benefits, one should engage in more than five hours of moderate physical activity (U.S. Department of Health and Human Services 2018).

Enough physical activity is known to have many positive effects. It lessens the risk to obtain noncommunicable diseases such as cardiovascular diseases, cancer, and diabetes, and is a fundamental mean for weight control (World Health Organization 2018). Guidelines-meeting physical activity predicts better cognitive functions, reduced anxiety and depression risk, and improved sleep and quality of life (U.S. Department of Health and Human Services 2018). Practiced three to five times on a weekly basis, physical activity also improves self-reported mental health (Chekroud et al. 2018). Most health benefits are gained by dividing the weekly physical activity into several days (UKK Institute 2018). Although a person would not meet with the weekly guidelines, the U.S. Department of Health and Human Services (2018) strongly encourage in even modest physical activity because of the overall health benefits it brings, especially for the people who are currently inactive.

Physical inactivity is among the top causes for death worldwide, yet over 80 % of the global adolescent population are physically inactive (World Health Organization 2018; U.S. Department of Health and Human Services 2018). Similar percentages appeared in recent publications among Americans, both adults and adolescents (U.S. Department of Health and Human Services 2018), and among Finnish adults (Husu et al. 2018). Finnish children and adolescents

land at 66-71 % with their inactivity, but a concern arises with the decreasing interest towards physical activity among older age cohorts from 19 years to 15 years of age (Kokko et al. 2016; Husu et al. 2016). Weighing both possible health gains with a regular exercise regimen and the very potential health problems that follow inactivity, it is difficult to understand, why so many individuals lack the necessary activity measures. Albeit, there might be other factors that are brought in the weigh-in too. To widen the understanding, individuals' economic preferences were taken to a broader review as Leonard & Shuval (2017) offer.

2.2 Risk as an economic preference

Risk behaviour is commonly linked to uncertainty instead of negative effects in the economics context, as Cocina (2014) states. Risk preference is a spectrum from risk aversion to risk-seeking behaviour with risk neutrality in between (Ert & Haruvy 2017; Cocina 2014). Leonard and Shuval (2017) describe that all individuals are risk-aversive to some extent. After reaching a certain point, they become risk-seeking. The point, where the shift of risk preference occurs, varies within individuals. (Leonard & Shuval 2017.) Cocina (2014) attaches risk aversion to a situation, where certainty undercuts expected value. Bayer, Shtudiner, Suhorukov, and Grisaru (2019) phrase that people with risk aversion do not tolerate future uncertain outcomes in comparison with risk-seeking ones. Harrison, Johnson, McInnes, and Rutström (2005) claim that risk aversion might be somewhat stable over time: subjects were found to be temporally consistent with risk aversion in a within-subject test. Ert and Haruvy (2017) state that these studies focus on the risk preference stabilities throughout repetitions instead of time. They have discovered that subjects change their risk preferences by recognizing risk neutrality is a better strategy when repeating the Holt and Laury (2002) experience (Ert & Haruvy 2017). In addition, subject's risk aversion has been identified to decrease over time in a game show context due to prior outcomes—making risk preference reference- or even path-dependent (Post, van den Assem, Baltussen & Thaler 2008; see also Tversky & Kahneman 1991).

Tversky and Kahneman (1992) agree that people are mainly risk-aversive but there are two types of exceptions. Firstly, people are risk-seeking if the probability of winning is small and gain is large. Secondly, risk-seeking behaviour occurs if the choice must be made between "a sure loss and a substantial probability of a larger loss" (Tversky & Kahneman 1992, 298). Their (1992) study on developing prospect theory resulted a confirmation on the different kind of behaviour with gains and losses. Subjects acted risk-aversive with gains and risk-seeking with losses, which applied especially with small probabilities. Somehow, subjects often overweighed the small probabilities. (Tversky & Kahneman 1992.)

Measuring risk behaviour isn't a single standardized procedure, rather a collection of different methods. Tversky and Kahneman (1992) have used a model where the subject is supposed to choose between two gambles, of which one is risk-aversive and the other risk-seeking, i.e.

$\left[prob(\$150) = \frac{1}{4}, prob(\$75) = \frac{3}{4}\right]$ and $\left[prob(-\$100) = \frac{1}{2}, prob(\mathrm{x}) = \frac{1}{2}\right]$, where x is a varying dollar amount. They have also expanded this to a situation, where loss is more strongly present and the subject is supposed to choose between two different kinds of prospects, i.e. $\left[prob(-\$20) = \frac{1}{2}, prob(\$50) = \frac{1}{2}\right]$ and $\left[prob(-\$50) = \frac{1}{2}, prob(\mathrm{x}) = \frac{1}{2}\right]$. This setting has been expanded with statements studying risk aversion and myopia by Conell-Price and Jamison (2015). Another rather renown experience is by Holt and Laury (2002) where individual chooses between two lotteries, of which one is less risky and the other riskier, but the distinction isn't obvious at first look. Anderson and Mellor (2008) have tested subjects' risk preference following the Holt and Laury (2002) lottery choice experiment and comparing with survey results. Their discovery was that experimental risk choices were significantly associated with the survey (Anderson & Mellor 2008). Another combination of surveying and experimenting has been conducted by Dohmen et al. (2005; 2011), who have measured subjects' attitudes towards risk with a rather renown large household survey and validated the survey with a smaller sample for an experimental setting.

Israel et al. (2014) used two types of scenarios that had either less or more risk integrated in the question. They asked, what is the maximum price subject would be willing to pay for a lottery ticket. Chances were either 50-50 % or 30-70 % for different prizes. (Israel et al. 2014.) Post et al. (2008) studied the game show Deal or No Deal? in different countries and repeated the show setting with own subjects. Then again, Weber, Blais, and Betz (2002) measured risk-attitudes with a relatively reliable (α=0.88; α=0.89) psychometric scale and found out that individuals have very domain-specific risk attitudes from i.e. risky financial behaviours to health and safety behaviours. Coppola (2014) compared incentivized experience with surveys consisting of risk-related statements and got very similar domain-specific results from both sources. Leonard et al. (2013) tested risk through an economic experiment that consisted of financial incentives, which is repeated and explained in detail later in this study.

Anderson and Mellor (2008) state that a person's risk preference influences health behaviours such as obesity, heavy drinking, cigarette smoking, and seat belt non-use, of which the latter two significantly. Coppola (2014) confirms a connection between risk-seeking behaviour and smoking, as well as connection between risk-seeking and active sport behaviour, especially from domain-specific risk measures. Conell-Price and Jamison (2015) connected increasing risk aversion with preventive health behaviour such as flossing, exercising, and eating healthy food, and decreasing risk aversion with disinhibited health behaviour, such as smoking, unprotected sex, and alcohol. Moreover, risk aversion was in direct causal relation with exercise, seeing the dentist on a regular basis, eating healthy food, and overall health. Somewhat surprisingly, there was a positive causal relationship with being depressed or anxious too. A negative causality was found between risk aversion and BMI. (Conell-Price & Jamison 2015.)

In this study, risk preference was studied based on a gambling model used in Leonard et al. (2013). As Leonard and Shuval (2017) propose, risk was also studied based on three risk-related cognitive biases: loss aversion, status quo bias, and habit. Out of these three, loss aversion denotes a situation where possible losses are overweighed in contrast of possible gains (Kahneman & Tversky 1979; Tversky & Kahneman 1992; cf. Cocina 2014). As Tversky and Kahneman (1991) describe: "losses loom larger than corresponding gains" (Tversky & Kahneman 1991, 1039). There is no certainty of gaining anything better, when individual sacrifices time for being active (Leonard & Shuval 2017), and this use-of-time comparison might happen in between physical activity and other undoubtedly enjoyable activity (Tversky & Kahneman 1991). Then again, loss aversion is reference-dependent: gains and losses are compared with a reference point—a shift of reference point may turn a previously experienced loss into gain and vice versa (Tversky & Kahneman 1991). Loss aversion is one explanation, why New York City taxi drives tend to stick with a specific daily earnings goal but not underachieve it (Camerer, Babcock, Loewenstein & Thaler 1997), and a reason, why game show contestants start taking bank offers seriously after a culmination point (Post et al. 2008).

Tversky & Kahneman (1991) maintain that status quo bias might be one explanation for experiencing loss aversion. Samuelson and Zeckhauser (1988) argue that status quo is a possible mean for avoiding risk and uncertainty in a general level, whereas loss aversion targets to certain gains and losses. Cocina (2014) describes status quo as a protected state, where people rather stay instead of making changes. Individuals in a choice context tend to prevail the status quo if possible. The more options occur, the more a current state is to be prevailed. (Cocina 2014.) Consisted with sticking with the current option as an active choice, status quo can also be considered doing nothing or as a passive choice (Samuelson & Zeckhauser 1988). At first, doing nothing might seem like any other behaviour, but there are more serious examples of prevailing the status quo: paralyzing over multitude of choices have been found to even prevent citizens participating in direct democracy (Hessami & Resnjanskij 2019).

Habit is a routinized behaviour that usually triggers from cues of past performance (Gardner et al. 2012; Wood & Neal 2009) and is automatic by the mind's default settings (Dolan et al. 2012). As with status quo bias, people tend to prefer their current habits from potential new ones (Wood & Neal 2009). Habit has its downside too: subjects tend to overestimate their future exercise amounts due to projection or present biases (Acland & Levy 2013). Charness and Gneezy (2009) bring up a different outlook: habit formation was created by providing economic incentives to start the activity routine. The point of handing out money was lowering the mental threshold to start any form of exercise and thereby letting the habit develop. (Charness & Gneezy 2009; cf. Gardner et al. 2012; Acland & Levy 2013.) Wood and Neal (2009) highlight that the threshold is especially low, when habit formation is a new territory for the individual.

Gardner et al. (2012) describe how habit formation consists of three phases: initiation, learning, and stability. These phases accent the importance of repetition instead of interesting variation in the process. They also argue that even with attempts on healthier lifestyle, habit formation is the challenging part: how to advance to the maintenance stage of physical activity? They advise to take into account the personal autonomy, where individual should maintain as much autonomy as possible for a better commitment. Moreover, chosen habits should be small, simple and manageable, and the expected time for habit formation and results might take even as long as ten weeks. (Gardner et al. 2012.) Wood and Neal (2009) add up that time pressure might be an obstacle giving unwanted cues from the current environment when initiating habits. Distractions and limited self-control, too, increase reliance on habits. Therefore, the foundation for habit should be created with better time resources. (Wood & Neal 2009.) Sniehotta et al. (2005) state that implementation intentions are a crucial factor. In other words, individual should decide when, where, and how, and focus less on the goals of physical activity. They also admit that higher self-efficacy leads to better results maintenance-wise. (Sniehotta et al. 2005.)

2.3 Time as an economic preference

Time preference was the other studied economic preference of this study. As O'Donoghue and Rabin (1999) state, people are rather impatient. Smith et al. (2005) describe time preference a state where current utility is in comparison to future benefits. Leonard and Shuval (2017) consider, how any good has a present value and a future value, and that these valuations might be appreciated differently. Moreover, O'Donoghue and Rabin (1999) highlight that people appreciate immediate gains, but they also like postponing losses. Bayer et al. (2019) state that time preference "expresses the value attributed to a benefit or an asset, an action or a feeling at a given time compared to the perception of its value at a later date" (Bayer et al. 2019, 139). According to Smith et al. (2005), low time preference translates to patience and good self-control, whereas high time preference states immediate benefit discarding the future value (see also Komlos et al. 2004; Zhang & Rashad 2008). Conell-Price and Jamison (2015) discuss term myopia for a short-sighted time preference. Shuval et al. (2017) use terms high future time preference for indicating patience and low future time preference for impatience. Leonard and Shuval (2017) describe a patient individual more likely saving money and emphasizing on future rewards, and an impatient individual focusing more on seizing the moment. This study follows the afore-mentioned line with terms patient time preference and impatient time preference. Moreover, terms present bias, time consistency, and future bias are used to describe individuals' tendency for receiving rewards (O'Donoghue & Rabin 1999).

It may not be easy to indicate time preference. Especially, when there is no absolute measure as Bayer et al. (2019) and Leonard and Shuval (2017) consider. One way could be studying subjects' savings rate and consumer debt (Komlos et al. 2004). A study by Shuval et al. (2015)

focused on subjects' future-orientation and whether they had a checking, savings, or investment account. Zhang and Rashad (2008) used a statement as a proxy for time preference. The statement inquired whether "desire but no effect" was subject's main obstacle for not losing weight (Zhang & Rashad 2008, 106). Kosteas (2015) performed a survey on the possibility of gaining a prize worth $1000 now or gaining some more after one month. The gist was how much an individual would demand more money. (Kosteas 2015; cf. Howard 2016; Israel et al. 2014.) Shuval et al. (2017) studied time preferences in relation to self-reported physical activity with an online survey. They provided hypothetical sums of money; either a lesser amount now or a greater amount in 30 days, and either a lesser amount in 30 days or a greater amount in 60 days. (Shuval et al. 2017; cf. Stoklosa et al. 2018; Conell-Price & Jamison 2015.) Faralla, Novarese, and Ardizzione (2017) describe this kind of model that i.e. Shuval et al. (2017) used as a standard in the time preference study. They went further with an explicit penalty model by providing options i.e. between 75 € in 61 days or 55 € today with a penalty of 20 €. (Faralla et al. 2017.)

Stoklosa et al. (2018) tested individuals' time preference according to three factors: present bias that accents the present moment on the cost of future, future bias that is the opposite of the previous, and time consistency that prefers neither the present nor the future. Deck and Jahedi (2015) used classical strategic games such as Prisoner's Dilemma and Stag-Hunt Game with delayed prizes in cooperation. Howard (2016) states many of the prevailing time preference studies to be too naïve, since these models don't consider the integrated risk preference within due to the incentivized aspect of not gaining a prize. His suggestion is giving the possible gains to charitable contributions, which didn't have a significant impact on risk preferences. (Howard 2016; see also Milkman et al. 2008; Deck & Jahedi 2015.)

Time preference has been connected to subjects' obesity (Komlos et al. 2004; Zhang & Rashad 2008) and even to obesity of subjects' children (Stoklosa et al. 2018). Impatient time preference might be an indicator of a higher BMI especially with certain ethnicities (Smith et al. 2005; Zhang & Rashad 2008). Impatience was a significant determinant for middle-aged women's smoking (Miura 2019). Anderson and Mellor (2008) studied subjects' short- and long-term time horizon, but they couldn't connect the horizon significantly with cigarette smoking, heavy drinking, obesity, seat belt non-use, nor driving over the speed limit. Khwaja et al. (2006) didn't find a significant connection with variations of time discounting and smoking status either. In turn, impulsiveness and lack of long-term-planning which might translate to more serious self-control problems indicated smoker status in their study. (Khwaja et al. 2006.) Deck and Jahedi (2015) connected impatience with lesser cooperation in strategic games. They also suggest that people consider themselves more patient than their peers. (Deck & Jahedi 2015.) Golsteyn et al.'s (2014) longitude study from five decades proved that patient time preference in adolescence has an important role with school success. Moreover, impatience relates with lower lifetime income, unemployment, welfare take-up, early death,

obesity, and teenage pregnancy. Time preferences had a more significant role with males and subjects who outperformed cognitive spatial ability tests. (Golsteyn et al. 2014.)

Shuval et al. (2015; 2017) connected subjects with patient time preferences with an improved likelihood of meeting physical activity guidelines. Kosteas (2015) discovered similar results based on subjects' hypothetical savings behaviour, especially with men and vigorous physical activity, and women and both vigorous and moderate or light physical activity. Conell-Price and Jamison (2015) discovered that an impatient time preference is positively connected with exercise, of which they thought results from the immediate relief exercise brings. Yet, they didn't find any significant connections with any of the other variables: alcohol abuse, flossing, eating healthy food, smoking, and BMI to name a few. (Conell-Price & Jamison 2015.) Kang and Ikeda (2016) proved that less patient subjects had more unhealthy attributes i.e. smoking, worse teeth, obesity, and ill health. Their results were significant with subjects who didn't recognize their own impatience: the naïfs. (Kang & Ikeda 2016.)

O'Donoghue and Rabin (1999) recognized the fact that naïfs should have different strategies for committing to expected behaviour in comparison to time-consistent people and sophisticates, who are time-inconsistent, yet they recognize that too. Naïfs are consistently overoptimistic on their time-related performance, whereas sophisticates predict personal future self-control problems correctly. If sophisticates realize they have an addiction towards something, they would refuse obtaining that product at all. At the same time, the naïfs would sincerely believe their future selves will act as if the time consistent individuals, i.e. consuming addictive goods in a moderate manner. (O'Donoghue & Rabin 1999.)

Time preference was surveyed according to Leonard et al. (2013) in this study. Also, two time-related preferences were studied as suggested by Leonard and Shuval (2017): intertemporal choice and licensing effect. Milkman et al. (2008) argue for intertemporal choice to be a significant factor in what they call a want-should conflict. Their synthesis is that people tend to postpone a should option in favour to a want option. They also claim that starting a diet from the beginning of next week or going to the gym tomorrow is easier than any action right now. (Milkman et al. 2008.) Sniehotta et al. (2005) have introduced the term intention-behaviour gap for this kind of dilemma, where outcomes are uncertain for the used time. In a way, the problem resembles loss aversion: one should give up time, effort, and comfort now in exchange of possible future health (Leonard & Shuval 2017). Faralla et al. (2017) studied intertemporal choice by clearly bringing up, how much the individuals would lose when choosing the now option instead of a future reward. This way, the future gain was framed as an immediate loss. The setting proved to be effective by increasing patience especially among female participants. (Faralla et al. 2017.)

Milkman et al. (2008) bring up licensing effect as one determinant for their want-should dilemma: having decided a good decision or made a good choice, a person might license them to make a guilty decision (cf. Monin & Miller 2001). Khan and Dhar (2006) expand this to subject's a perceived outlook on them. If a person distinguishes being a virtuous individual among other people, this might lead to a self-licensing behaviour of doing something guilty pleasure. (Khan & Dhar 2006.) Prinsen et al. (2019) found out that the closer a subject is to their weight-losing goal, the more licensing on high-calorie snacks there occurs. Rosenkilde et al. (2012) discovered compensation effect in a randomized controlled trial among male participants, who participated in an exercise program. Compared to the control group, the ones participating in either moderate or vigorous exercise, licensed intense exercise with a higher caloric intake. (Rosenkilde et al. 2012.)

Khan and Dhar (2006) argue that people don't make isolated decisions, even if it might seem like it. Prinsen et al. (2019) licensed female subjects with their prior academic success, which led to a higher caloric consumption of almost 119 kcal per subject. Khan and Dhar (2006) came to a consensus in the consumer choice context that "prior decisions can also serve as a license to choose options that are inconsistent with the salient self by boosting a person's self-concept" (Khan & Dhar 2006, 259). Having chosen a virtuous and altruistic deed, i.e. teaching children or improving the environment, one was more likely to choose unnecessary commodities such as a pair of jeans or more expensive sunglasses instead of necessary ones such as a vacuum cleaner or inexpensive sunglasses. This occurred after completing filling questions, too, which might mean the virtuous and licensing choices do not need to occur consecutively. (Khan & Dhar 2006.)

Was there a connection between economic preferences with physical activity, one way of making an impact could be priming as Israel et al. (2014) discovered. In their study, using pictures of old people gave subjects more patient time preferences, whereas using pictures of vacation made them less patient. Vacation pictures also influenced on subjects' risk preferences by making them more risk aversive. (Israel et al. 2014.) Khan and Dhar (2006) state that priming could also awaken a person's identity and therefore their expected behaviour, but this is not a foregone conclusion: there exists a possibility for an undesirable effect due to self-licensing and enabling behaviour. Another time-related influence could be framing the future gain as an immediate loss as Faralla et al. (2017) did. Their subjects were clearly told choosing the now option would cut a share from their reward. This test was conducted with monetary incentives, but it could be expanded to physical activity by presenting the future gains versus immediate losses. (Faralla et al. 2017.)

2.4 Stages of change model as a mean for measuring physical activity

PASC is a self-reported physical activity taxonomy studied by Leonard et al. (2013) among others. These stages consist of subject's current physical activity habits and the length of engaging in the habits through a change process: precontemplation, contemplation, preparation, action, and maintenance. (Leonard et al. 2013.) The stages of change process has been introduced by Prochaska and DiClemente (1983) and described by Marcus et al. (1992) as following: precontemplation individuals do not have any intention on making changes, contemplation individuals are considering a change, preparation individuals are making small changes, action phase individuals are actively engaging in behaviour change, and individuals in the maintenance phase are making an effort on sustainable behaviour change.

Dumith et al. (2007) mirrored the stages to clearer timelines such as physical activity conducted during past six months and planned for the following 30 days. Marcus et al. (1992) discovered that with individuals, the process of engaging in sustainable physical activity habits might not be gradually and systematically increasing, though, but rather experiencing different stages and cycles before settling to a maintenance routine. A critique towards the stage model has been the lack of stability in predicting stage change from contemplation (Plotnikoff et al. 2010). Otherwise the model has been greatly validated (Leonard et al. 2013; Dumith et al. 2007; Garber et al. 2008; Marcus et al. 1992).

Previous studies on stages of change have been imposed on attempts at both quitting smoking and starting physical activity. In the smoking cessation context, Prochaska and DiClemente (1983) discovered that a subject's self-reflection, social reflection, and willingness to quit a harmful behaviour increase vastly the closer a person is to the action phase in particular. In turn, DiClemente et al. (1991) concluded that an individual should be at the preparation phase at the fewest to increase the frequency of smoking cessation attempts and to finally quit smoking successfully. Marcus et al. (1992) transferred the setup from a smoking context to physical activity and proved that change processes do not start in the precontemplation phase, yet they activate and grow unevenly towards the action phase. Sniehotta et al. (2005) argue that there must be an intention to start preparing for action; non-intenders do not act towards action. On the other hand, Bezyak et al. (2011) discovered that higher behavioural processes, such as self-liberation and stimulus control, predict almost four times the likelihood of being in a more advanced stage among people with mental illnesses, and their result included all the stages—precontemplation stage included (see also Kirk, MacMillan & Webster 2010). Plotnikoff et al. (2010) confirmed this behavioural process result, in addition to cognitive processes and listing pro-sides of physical activity, and discarded type 1 or 2 diabetes as a significant predictor (see also Bezyak et al. 2011; Kirk et al. 2010). Sniehotta et al. (2005) discovered that self-efficacy, outcome expectancies, and risk awareness predicted intentions,

which in turn predicted action planning. They also found out that action planning, action control, and self-regulation predicted exercise behaviour, action control as the strongest predictor. (Sniehotta et al. 2005.)

In a study by Garber et al. (2008), being female, Hispanic, on a lower education level, or on a lower health status predicted status in a less advanced stage, whereas being underweight predicted status in more advanced stages. Dumith et al. (2007) studied residents of a Brazilian city and argued that subjects with a higher education level and a better perceived health were in more advanced categories. Also, being young or middle-aged, or having a higher economic status or family income predicted position in more advanced stages, whereas being married or having a smoking history predicted a less advanced stage. (Dumith et al. 2007.)

PASC have also been studied among special age groups. Walton et al. (1999) detected causality between high activity and the advanced stages among school children. Haas and Nigg (2009) found significantly strong Post hoc Bonferroni comparisons among higher physical activity levels and maintenance stage among two separate groups of children. The trend was similar among the elderly in a study by Riebe et al. (2005). Patterson et al. (2006) also agreed on the trend and found a correlation between PASC and high self-efficacy to raise physical activity weekly among young male participants. Self-efficacy could be defined individual's self-assurance for change (Kirk et al. 2010; cf. Sniehotta et al. 2005). Plotnikoff et al. (2010) predicted that self-efficacy, regardless of gender, was a significant predictor for maintenance status among diabetics in a longitudinal study. Walton et al. (1999) noted in their study that a significantly larger number of boys had maintenance status, whereas a significant number of girls were in preparation stage.

The key findings for Leonard et al. (2013) were that a subject's higher income class predicted more advanced stages in physical activity. Even more, as this study focuses on the combination of risk tolerance, temporal patience, and PASC, their finding was that greater risk tolerance and temporal patience predicted more advanced stages on their PASC scale in an African American population (Leonard et al. 2013.) This study was built on similar domain, yet, adding up an element of risk- and time-related statements in a Finnish case organization.

3 Physical activity and economic preferences research

This section describes the conducted research as minutely as possible for a clearance on what has been done. The description includes the whole research setting and the survey itself with reasonings, why certain decisions have been made. In addition, a key point of a qualitative study is replicability (Dul & Hak 2008; Ronkainen, Pehkonen, Lindblom-Ylänne & Paavilainen 2011). The importance of a single study tends to increase, if same or close to similar setups have been replicated over and over. For any further questions, one can contact the author.

3.1 Research design in this physical activity report

Nummenmaa (2009) describes the type of research frame used in this study correlative: study population and object were chosen, data-gathering was conducted with an online survey, data-analysing was followed through, and conclusions were drawn afterwards. The research process started in spring 2018 with an orientation on previous studies, followed by phases of planning this study, gathering further theory, conducting a survey (appendix 1), analysing the data, and building conclusions. Finalization was executed during autumn 2019.

This study surveyed staff members of a medium-sized company through a cross-sectional self-report study in June 2018. The case organization was a Tampere-based telesales business (Business Information System 2018) and the company average person-year was 165 in year 2017 (Suomen Telecenter Oy 2018). The survey was open for replies on June 15th-21st 2018 including all staff. Results of this study are analysed in detail further on, but as curiosity should be mentioned that background variables of this study refer to many young workers in the case company: mean age was 26.0 with a standard deviation (SD) of 7.8 (appendix 2).

Employees were assumed to participate mainly through sedentary, non-physically strenuous, display screen work. This is a fascinating target for studying physical activity but also has serious downsides: too a sedentary lifestyle kills in the long run (Kolu & Vasankari 2018) and lesser physical activity costs are billions even in a smaller society like Finland (Kolu, Vasankari & Raitanen 2018). On average, Finnish people sit and stand still three quarters of their waking hours, which leaves rather little space for being active (Husu et al. 2018).

The research method was a case study where an individual case is studied thoroughly and conclusions are drawn from into a generalizable form (Holopainen & Pulkkinen 2013; Ronkainen et al. 2011). Generalizability is a strong statement, though. Malmsten (2007) highlights that a case study always connects to a certain place, time, and context. Instead of generalisability, Dul and Hak (2008) emphasize the importance of replicability. Replicability is possible, if the study is quantitative, measured, and properly described (Ronkainen et al. 2011). In the psychological context, Kazdin (1981) defines case study "intensive investigation of the individual client" (Kazdin 1981, 184), where the client could be understood as any kind of isolated case and all the research details are described. On some level, a case should be different or interesting to become target of a study (Nummenmaa, Holopainen & Pulkkinen 2014).

The big-picture critique for defining a research method comes from Laine, Bamberg, and Jokinen (2007), where they address multifaceted use for the word method and instead recommend using terms such as research practice or research strategy which include a variety of data and methods. Vilkka, Saarela and Eskola (2018) describe case study as an attitude of using various methods. Acknowledging the critique this study uses the term research method.

Many methodology authors would classify this study quantitative (Hirsjärvi, Remes & Sajavaara 2016; see also Vilkka et al. 2018; Ronkainen et al. 2011). Whereas, Holopainen and Pulkkinen (2013) describe a study qualitative, if there has been used ordinal or categorical variables as in this study. Dul and Hak (2008) limit case studies using qualitative methods only, whereas a survey would be quantitative. This study is about quantifying physical activity habits in the context of risk and time by using quantitative data analysing methods and a rather large sample. Ronkainen et al. (2011) point out that quantitative research aims at benefiting from quantity. Therefore, it would be more organic to define the study quantitative.

Scope of this study was to use a cross-sectional survey design to explain—to study the cause and effect—if the case subjects' economic preferences influence their amount of weekly physical activity. Some parts of the survey were adapted from Leonard et al. (2013) and other parts were created based on the literature review. This study focused on subjects' risk and time preferences (Leonard et al. 2013), in addition to certain biases related with risk and time: status quo, habit, loss aversion, intertemporal choice, and licensing effect (Leonard & Shuval 2017). Other possible risk- and time-related cognitive biases were excluded. This is part of a larger need in combining more validated behavioural economics study in line with physical activity (Leonard & Shuval 2017). There have been assumptions that physical activity decisions are related to both decision context and situational context (Frank 2007). Especially, certain risk- and time-related cognitive biases seem to be active operators in the decision-making moment of committing to physical activity (Leonard & Shuval 2017).

Objective for this study was to build a model of the factors that have a causal effect on PASC among the case company employees. This model could be used in encouraging to sustain and maintain lasting healthy physical activity habits in the case organization. Moreover, there would be a theoretical and empirical base for further testing in the form of randomized controlled trials and multivariate tests. The key is to find the significant factors of the risk- and time-based cognitive framework. Other assumed factors might have a lesser effect in the light of statistical evidence, and could be even scanted, until results of this study outmode.

3.2 Online survey for gathering data on physical activity and economic preferences

The data collecting method was an online survey for all current case subjects (appendix 1). A survey is commonly used to gather information in a standardized form and to describe, compare and explain a phenomenon (Hirsjärvi et al. 2016; Holopainen, Tenhunen & Vuorinen 2004). The survey form was created with Google Forms. Subjects were expected to answer using their work computers, which Pahkinen (2012) defines computer-assisted web interviewing. The link was shared through work email by a member of the board. Two reminders of the survey were sent during the survey period. The key employees were also pitched in advance to engage their team members to answer. Pahkinen (2012) advises to pre-test a survey before the actual use. The survey was tested with a group of four outsiders in advance for the user-

friendliness and easily understood questions, and some changes were made after the feedback. The actual survey was conducted between June 15th and 21st 2018 among subjects.

The study included five background variables: gender, highest level of degree, age, height, and weight. Gender was divided into three categories: male, female, or other. The highest level of degree had five categories: comprehensive school, higher secondary school or vocational school, university of applied sciences, university, or other. Age, height, and weight were open questions, and subjects were informed to answer with integer numbers. All the other questions were closed. The units of measure were years, centimetres, which were converted to meters, and kilograms respectively. A BMI value was calculated afterwards for each subject a standard formula $\frac{kg^2}{m}$ (World Health Organization Regional Office for Europe 2019). The formula is for adults over 20 years, even if some of the replicants were 18-19 years old (appendix 2). The BMI classification is presented in table 1.

BMI	Nutritional status
Below 18.5	Underweight
18.5–24.9	Normal weight
25.0–29.9	Pre-obesity
30.0–34.9	Obesity class I
35.0–39.9	Obesity class II
Above 40.0	Obesity class III

Table 1: BMI classification (The World Health Organization Regional Office for Europe 2019)

Some background variables were excluded in comparison to Leonard et al. (2013) because there were additional sections that lengthened this survey. The annual income question was left out from this study on purpose, even if it might be a rather common manner (Leonard et al. 2013; see also Chekroud et al. 2018). A question about income might be perceived as a too personal matter in Finland, which could increase the risk of nonresponse. Other background variables that were left out in comparison to Leonard et al. (2013) were: marital status, ethnicity, adequate health insurance, and waist circumference. Marital status was considered as a curiosity question. Ethnicity was perceived too personal and too uncommon question in Finland. The Finnish healthcare system provides all the citizens an adequate health insurance, so this question could be considered odd. Making subjects measure their waist could have again increased nonresponse if subject wasn't equipped with a measuring tape.

Next section of the survey considered subjects' physical activity habits. This section was developed from Leonard et al. (2013). First three questions were based on current weekly physical activity recommendations on moderate physical activity, vigorous physical activity, and muscular endurance and motor skills supporting physical activity based on national and global

recommendations (UKK Institute 2018; World Health Organization 2018; U.S. Department of Health and Human Services 2018; see also Kosteas 2015). The following question considered length of engaging in any current physical activity habit (adapted from Leonard et al. 2013). These four questions in total were the elements of PASC. In addition to PASC, subjects were asked about their sedentary behaviour: how much they stand still, sit still, and lie down daily (adapted from Kolu & Vasankari 2018; Husu et al. 2018; cf. U.S. Department of Health and Human Services 2018). Later, they were asked to give an evaluation on their current status of health (cf. Leonard et al. 2013).

The economic preferences section was modelled from Leonard et al. (2013). First question tested risk aversion. Subject was asked to imagine participating in an imaginary coin toss with prizes for heads and tails. Then, subject was to pick a game they pleased to find out how risky a game they prefer. Options started from the most neutral prizes and ended with the least neutral. Chances for each side of coin were 50-50 % as in any coin toss. The participants got values on a scale of one to six. Scoring one point indicated risk aversion choosing coin toss with even prizes of 40-40 €. Scoring six indicated highest risk-seeking behaviour choosing coin toss with the most uneven prizes of 130-(-10) €. Though, it should be noted that the coin tosses raised the expected value along higher scores; the expected values were respectively 40, 45, 50, 55, 60, and 60. (Leonard et al. 2013; Khwaja et al. 2006.) The original study used US dollars, but this study used the local currency euros. The amounts of money were kept the same despite possibly different standard of living between the mixed worker and white-collar classes in Finland and low-income African American communities.

Second question dealt with time preferences and was, too, based on Leonard et al. (2013). Subjects were asked to choose a smaller amount now or a larger amount after six months. The amounts were presented in a table. The order was ascending, indicating a proxy for impatience and patience: the first row started with the smallest amount of money, and the last row had the largest amount. The present option was a stable 50 euros, and the future option varied between 51-150 euros. The participants were divided into three categories. Present-biased included people who always chose the present option. Time-consistent subjects chose the future option at least once but no more than three out of six rows. Future-biased chose the future option four times or more. (Leonard et al. 2013; cf. O'Donoghue & Rabin 1999.)

Last part of the survey included 17 Likert-scale statements and was brought as a new element to the study tradition. Answering options were ascending from left to right from strongly disagree to strongly agree. First statement asked about the subject’s general evaluation of his or her current state of physical activity from particularly poor to particularly good. Other physical activity statements had either risk- or time-related cognitive biases integrated in: status quo bias, habit, loss aversion, intertemporal choice, and licensing effect. Each bias was in-

cluded in three to four separate statements. These statements were formed based on the literature on risk-and time-related cognitive biases and were tested for the first time. Validity and reliability of the statements are evaluated later in this chapter.

3.3 Methods of this physical activity report

Analysing methods of this study and their purpose are listed in table 2. Ordinal logistic regression was chosen to fit well the ordinal data and to compare the results with Leonard et al. (2013). Multiple linear regression was chosen to compare the results as a curiosity factor. In addition, both these methods were used by Bezyak et al. (2011) in their study of PASC in relation to behaviour change processes. Additionally, either or both methods were used by Walton et al. (1999), Plotnikoff et al. (2010), Shuval et al. (2015), and Faralla et al. (2017).

Methods for analysing the data

Method	Purpose
OLR	Main method for a first analysis
MLR	Comparison for the first analysis
SEM	Refining the model
Pearson Correlation	Completing the SEM

Table 2: Data-analysing methods of the study.

Regression models explain the relation between a dependent variable and one or more covariates (Bender & Grouven 1997). Primary data analysing method of this study was OLR that is commonly used for determining, which variables explain most variation in a dependent variable (Metsämuuronen 2008). It is typically applied for binary response data, yet, there are also multiple variable models (Bender & Grouven 1997). If data are divided into a dichotomous form, valuable information might be discarded (Scott, Goldberg & Mayo 1997). OLR model is a method for grouped ordinal variables as the dependent variable; these variables are Likert-scale or similar, and they interpret opinions versus the odds of a unit change in the specified behaviour (Hanneman, Kposowa & Riddle 2013; Hosmer, Lemeshow & Sturdivant 2013; Xiong, Findlay & Meullenet 2008; Nummenmaa 2009). Whereas, Nummenmaa (2009) argues that the independent variables can be anything from ordinal to scale, and from interval to difference in quality. To predict certain behaviour, OLR model can be used in behavioural sciences too. (Nummenmaa 2009.) Thus, instead of using plain verbal opinion categories from strongly disagree to strongly agree, categories are given real numerical distances or at least best estimates of the distances (Norusis 2012). Abstract and unobservable concepts such as perceived health or categorical values of physical activity, which are measured rather subjectively, are given numerical values and put in relation to the data mass (Zumbo & Ochieng 2002).

A common OLR model is the proportional odds model, that is the cumulative odds model or cumulative logit model (Bender & Grouven 1997). Basic assumption for the proportional odds

model is that intervals between the variables are not equal and that the ordering is not natural (Xiong et al. 2008). Scott et al. (1997) recommend using the proportional odds model especially if there is no reason for dichotomizing the data. The standard formula of the proportional odds model is: $\ln \theta_j = \ln\left(\frac{prob(score \leq j)}{1-prob(score \leq j)}\right) = \alpha_j - \beta X$, where θ_j is the odds for a certain event to occur (Norusis 2012). Probability of a single response, $prob(score \leq j)$, is in comparison to one or more reference responses, $1 - prob(score \leq j)$ (Hosmer et al. 2013). α_j is a threshold value, which stays stable despite changes in the values of independent variables; β is the coefficient that gets positive or negative values (Norusis 2012; Nummenmaa 2009). The sign of the coefficient is reversible: one can simply switch the sign from plus to minus or the other way around, if one should calculate the odds of stepping from a higher category to a lower (Hosmer et al. 2013). OLR model uses maximum likelihood for calculating the most plausible and as near as possible values to the observed values (Metsämuuronen 2008).

Xiong et al. (2008) define odds as the probability of an event happening or success divided by the probability of an event not taking place or failure: $\text{odds} = \frac{probability\ of\ event}{probability\ of\ no\ event} = \frac{p}{q} = \frac{p}{1-p}$. Success is labelled p and failure q or $(1-p)$. It is a standard procedure to work with the log odds, instead of the actual odds, and therefore the ordinal formula looks like this: $\ln\left(\frac{p}{q}\right) = \ln\left(\frac{p}{1-p}\right) = \log(odds) = \text{logit}(p)$, where "the log base *e* (log) of the odds is therefore defined as the logit or the log odds" (Xiong et al. 2008, 131; see also Hosmer et al. 2013). The reason for working with the log odds instead of the actual odds, is the range of variation: odds get values between zero and one, whereas log odds range is infinite and thus less complicated to interpret (Ketokivi 2015). Odds ratio comes from dividing the odds of an event happening in one group by odds of event happening in another group (Xiong et al. 2008).

As a comparing method, a linear regression model is another way of studying causality of a dependent variable and one or many independent variables (Washington, Karlaftis & Mannering 2011). Data used in this research consisted of multiple predictors and therefore required multivariate regression analysis (Metsämuuronen 2008; Hanneman et al. 2013). MLR model improves the precision of modelling, because any explicable human behaviour is likely to be sum of many parts instead of a single determinant (Nummenmaa 2009). Normal assumption for the regression model is exogenous, which means that factors outside model determine the dependent variable too (Ketokivi 2015; Washington et al. 2011).

Metsämuuronen (2008) states that a detailed way of describing the method would be explorative regression analysis that aims at studying the most essential predictors that determine the factor. Metsämuuronen (2008) and Ketokivi (2015) describe the MLR formula in detail as following: $Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + .. + \beta_i X_i + \varepsilon$, where Y is the dependent variable. β_0 is the Y-intercept value penetrating the Y-axis. $X_1 - X_i$are the independent variables that get identical number of weighting coefficients $\beta_1 - \beta_i$. (Metsämuuronen 2008; Ketokivi 2015.) β

tells how much the values of a dependent variable increase as the value of an independent variable increases by one unit (Hanneman et al. 2013). According to Washington et al. (2011), these β values vary from sample to sample, and their main purpose is to give an evaluation of how the phenomenon would occur in real population. Last part of the equation is error term ε that is also known as disturbance term. (Washington et al. 2011.)

SEM was used as a refining model (table 2). SEM is a way of understanding the covariance by modelling the variables, and the model is rather commonly used in behavioural sciences (Nummenmaa 2009; Hooper, Coughlan & Mullen 2008). It is also one way of validating any previously tested model (Metsämuuronen 2008). Nummenmaa (2009) states that Instead of one equation, SEM uses a linear system of equations, that is most optimal for continuous variables but manageable for other types of variables too. Optimally, SEM can be used for more complex regression in comparison to any regression model that has one dependent variable. (Nummenmaa 2009; see also Metsämuuronen 2008.)

Nummenmaa (2009) explains that the SEM consists of observed and latent variables. Observed variables are variables measured in the research. Latent variables are deduced from the variance of the observed variables and they don't have any specific measuring scale. Both types of variables can be either exogenous or endogenous variables. Exogenous variables aren't determined by the other variables of the model. Endogenous variables are internal variables; these types of variables aren't free to vary nor covary since they are determined by the other variables. (Nummenmaa 2009; Kline 2011.)

This study used complete enumeration as sampling method. According to Holopainen et al. (2004) and Holopainen and Pulkkinen (2013), a distinguishing factor for complete enumeration is that all the elements are studied, and the sampling method should give a representative sample of the population with careful planning and execution. Yet, Dul and Hak (2008) question the definition of a complete enumeration by stating that "populations are never 'representative' for an entire domain" (Dul & Hak 2008, 46). A common reason to choose complete enumeration or total population sampling is a particularly small group that should be studied—an organization in this case (Vilkka et al. 2018; Ronkainen et al. 2011). A critique towards any organization population is the possible lack of a definitive list of all the current population, which decreases the representativeness (M. Jones 2014). Population of this study was based on the case company annual report with a total average person-year of 165 (Suomen Telecenter Oy 2018). To support the idea of total sampling, any kind of random sampling would have decreased the sample size to less than 100 (Nummenmaa 2009) or studied more than 50 % of the population base units, which is not recommended (Holopainen & Pulkkinen 2013). The whole working staff had to be surveyed during the one survey week. Only major obstacle could arise from individuals taking vacation, since it was already the Finnish

vacation season, and this might have violated the study coverage since the survey would be sent to working emails.

By 21 June 2018 that was the last possible day for taking part in the survey, there were 144 answers. This makes a unit nonresponse rate of 13 %, whereas Pahkinen (2012) has estimated that a general survey average nonresponse would be 30 %. According to him, even studies that cover all the population elements have nonresponse that causes a deficit in the data collected. (Pahkinen 2012; cf. Sreejesh, Mohapatra & Anusree 2014; Tourangeau & Plewes 2013; Golsteyn et al. 2014.) One reason behind nonresponse might be failure to contact all the elements of the sample or a refusal of responding (Fuller 2009). More reasons might be a lower sociodemographic status or a negative attitude towards surveys (Tourangeau & Plewes 2013). Pahkinen (2012) considers that nonresponse is observed to cause bias and inaccuracy in the results by increasing the standard errors and confidence intervals (CI) in proportion, which should be taken into consideration when analysing results.

Completing the survey wasn't compulsory, but the staff were expected to answer. The staff was informed to take part in advance. A dedicated member of the board sent two reminders of the survey during the answering period and circled around to make sure everyone had received the message of an ongoing survey. Most team leaders reserved time after morning meetings for their own team to answer the survey in quiet. Answering was anonymous to increase the response rate and lower the threshold for answering questions such as age, weight, and physical activity regimen, which might be perceived too personal. Moreover, the survey didn't include any questions considering the staff's working position in the company, their income, supervisor, or sales project, to blur the traces of any individual. A large part of the focus was in minimizing the nonresponse.

Online survey as a data-collecting method can be considered as a risky business for a very low expected response rate (Sreejesh et al. 2014). At the same time, the possibility of gathering a spread staff in a digital commonplace, saving time with not having to deal with the paperwork, and a desktop-oriented staff supported online survey as data-collecting method (M. Jones 2014; cf. Holopainen & Pulkkinen 2013). There were a few other factors that supported choosing online survey. Firstly, the staff consists of mainly young people who should be more digitally oriented. Secondly, the target group was within an organization, instead of picking up random email addresses or publishing the survey at any random website, which made collecting the answers rather focused. Thirdly, supervisors and other key personnel were pitched why this study was important among the staff—any procedure that aims at increasing physical activity would be welcomed at the case company—so they were willing to give time for replying during the working hours. Fourthly, online survey is relatively cost-free, and this case wasn't paid or budgeted. This wouldn't be a valid reason alone but a realistic excuse for any struggling student working alone and without funding.

3.4 Validity and reliability of this physical activity research

To ensure a valid research process, Tavakol and Dennick (2011) and Nummenmaa (2009) highlight the need to understand, whether the research method provides valid answers to the preset research question. Kazdin (1981) criticizes case study validity for lack of control in the experiment, in comparison to controlled experiments, since it would be impossible to validate which action has led to the wanted outcome. Yet, he recognizes that the information a case study provides can be utilized almost as properly as controlled experiments, if data were objectively collected. (Kazdin 1981.) As Hirsjärvi et al. (2016) point out, indicators and methods don't always respond to the reality researcher is trying to study (cf. Nummenmaa 2009; Pahkinen 2012). Ketokivi (2015) underlines that it should be clearly understood what an indicator truly measures. A way to improve validity of a research is to explain in detail what was done and how it was done (Hirsjärvi et al. 2016). In addition, one should describe who the respondents were and how the questions were asked (Ketokivi 2015).

Requirements for content validity and uniformity of reliability are met when researcher has credibly argued for the theory of the indicators and given enough indicators (Ketokivi 2015). This survey consisted of background questions, questions connected to physical activity habits, questions considering risk and time preference following the tradition of incentivized economic experiments and re-testing as explained in Leonard et al. (2013), and statements on physical activity with a Likert scale (appendix 1). The statements had risk- and time-related cognitive biases integrated in. The critique towards this kind of statements is that the statements might be understood from many points of view and one question would measure more than one dimension—thus the indicators wouldn't be unidimensional (Ketokivi 2015) and each subject might understand concepts and questions differently from their current status or viewpoint (Nummenmaa 2009; Ketokivi 2015). For example, physical activity might be understood as pure exercise or any kind of movement from one place to another (Pahkinen 2012).

A single statement might measure many underlying factors, cognitive biases in this case, instead of the aimed one (Sudgen 2017). Ketokivi (2015) recommends surveying each factor with four indicators to acquire better unidimensionality. This survey consisted of mainly three indicators to keep the survey readable and short enough. To lessen the nomological validity, or how a single term is understood, Ketokivi (2015) encourages measuring correlations between indicators that are supposed to measure the same concept. A Pearson correlation test measured statistically significant correlations in majority of the indicators in this study. Risk statements considering status quo, habit, and loss aversion resulted all statistically significant correlation ($p<0.001$) Other indicators weren't completely cohesive in their own domains. Only two out of four intertemporal choice indicators and two out of three licensing effect indicators had a statistically significant, mutual Pearson correlation ($p<0.001$) (appendix 3).

This study violated the tradition of using real money for the economic preferences since no money was budgeted. Thus, results may be interpreted less normative compared to using real money at stake as in the tradition of experimental economics (Hertwig & Ortmann 2001). Also, Anderson and Mellor (2008) point out the problematic nature of testing hypothetical choices instead of using real money. Holt and Laury (2002) discovered a significant difference between real payoffs and hypothetical questions; subjects given real money were significantly more risk aversive. Then again, Tversky and Kahneman (1992) are very comfortable with both incentivized and non-incentivized experiments stating that most of the rewards are rather small for working people in any case. Coppola (2014) encourages for using hypothetical lotteries in surveys due to relevantly good reliability.

Leonard and Shuval (2017) understand that not all studies have the money to use, and accent on measuring survey reliability. Hertwig and Ortmann (2001) found that the study tradition of behavioural decision-making used real money in only 15-26 % of the studies published, and the likelihood of using real money decreased if the study was conducted by psychologists only in comparison to at least one economist on board. Alas, their study used papers from 1988-1997, and there might be a change in the standard. (Hertwig & Ortmann 2001.) Shuval et al. (2015) defend the practice of using hypothetical questions due to the easiness and cost-free aspect by saying that measures on self-report of psychological tendencies and self-report of financial behaviours "provide consistent estimates of a statistically significant relationship with physical activity, despite not using the gold standard of economic experiments" (Shuval et al. 2015, 952). Also, Kosteas (2015) and Israel et al. (2014) used hypothetical cash prizes.

Analysis of this survey continued with reliability. Reliability is defined as the repeatability of the study (Hirsjärvi et al. 2016). Cronbach's Alpha is a common way for measuring reliability, and it measures internal consistency on a scale from zero to one in the questionnaire data (Tavakol & Dennick 2011). A recommended value ought to be 0.70-0.90 (Tavakol & Dennick 2011) or 0.80-0.90 (Nummenmaa 2009). The method is especially suitable if measuring consists of multiple parts, such as multiple statements in a survey, and Common Alpha value rising elements are a long survey and a strong correlation between variables (Tavakol & Dennick 2011; Nummenmaa 2009). The more homogeneous a sample is, the higher values of Alpha should occur (Ketokivi 2015). High reliability increases validity of a test, because low reliability would never measure the desired object reliably, but reliability should never be the only criterion for proper validity (Nummenmaa 2009).

Having excluded scale-type background variables, which are age, height, weight, and BMI, Cronbach's α for the rest of the variables was 0.79 that is perceived as a high enough value for reliability. The detailed item-total statistics is listed in the appendices section (appendix 4). Out of 144 answers in total, 128 (89 %) were rated as valid and 16 (11 %) excluded. Including scale-type variables, α would have been only 0.43. Alpha was also run without summed

scales and previously mentioned background variables. The result was 0.66 which is still close to acceptable but lower. Summed scales raised the α value 0.13 points, as their tendency is (Nummenmaa 2009). The analysis of variance (ANOVA) test included summed scales and excluded variables age, height, weight, and BMI. There was a significant difference, $F(127,41)=69.70$, $p<0.001$.

4 Data on economic preferences and physical activity stages of change

This section focuses solely on the data that were received based on the survey, how it was analysed, and what are the immediate results. Key parameters of the data are introduced. Direct results and goodness-of-fit tests are presented from the OLR, MLR, and SEM respectively. Data were post-processed to complete the observation matrix. Having received the survey data, following variables were added to the matrix (table 3).

Post data-gathering variables in the observation matrix

Variable	Type	Consisting of
BMI	Grouped according to table 1	Variables height and weight
PASC	Summed scale, 5 groups	Questions 6-9
Sedentary behaviour	Summed scale, 5 groups	Questions 10-12
Risk preference	Summed scale, 3 groups	Question 13
Time preference	Summed scale, 3 groups	Statements in question 14
SQ	Summed scale, 5 groups	Statements 16, 20, and 26
H	Summed scale, 5 groups	Statements 17, 25, and 31
LA	Summed scale, 5 groups	Statements 18, 24, and 29
IC	Summed scale, 5 groups	Statements 19, 21, 23, and 28
LE	Summed scale, 5 groups	Statements 22, 27, and 30

Table 3: Post data-gathering variables in the observation matrix

Summed scales were used for simplicity and to decrease the large number of variables, acknowledging the fact that some data might get lost in the process. All the other summed scales were observation averages except for time preference that was a sum of observation variables. BMI was grouped according to the global classification (table 1). PASC and sedentary behaviour were divided into five groups after the original variables' answering choices. Risk preference was divided into three groups: risk aversive as the ones who scored zero points, subjects in-between scored one to three points, and risk-seeking scored four to five points. Time preference was also split in three parts: present-biased as the ones who scored zero points, time-consistent subjects scored one to three points, and future-biased scored four to six points. Risk- and time-related cognitive biases status quo, habit, loss aversion, intertemporal choice, and licensing effect, were summed scales consisting of five groups following the original Likert-scale. Data were analysed with IBM SPSS Statistics 23 and Ωnyx.

This study had total 144 replies (N=144). Individual questions received 140-144 answers. Majority of the subjects were male (63 %) and relatively young: subjects were between 18 and 55 years, with 26.0 being mean age (SD=7.8). Median age was 23.0 and mode age 21.0. Most of the subjects chose higher secondary school or vocational school as the highest level of education (68 %). Mean BMI was 25.9 that is categorized in the pre-obesity class (SD=5.7). Median BMI was 24.6 and mode BMI was 23.1, which both belong to the normal weight category. More precise frequencies of the background variables are listed in appendix 2. Compared with Leonard et al. (2013), this sample was noticeably more male-dominant with approximately opposite percentages and almost twenty years younger on mean average.

Perceived health was mostly rather good (49 %) or particularly good (27 %). Most reported daily sedentary behaviour was between four and six hours (49 %) and second-most reported sedentary behaviour two to four hours (36 %). PASC distributed as follows: preparation stage was most popular stage (32 %), followed by action (28 %) and contemplation (24 %). Least popular stages were maintenance (14 %) and pre-contemplation (2 %). Detailed summarization according to PASC is listed in appendix 5. The stages were distributed very differently in comparison to Leonard et al. (2013), with roughly the whole rank turned other way round. A Chi-squared test of independence was performed to examine the relation between PASC in this study and Leonard et al's (2013) following the principle of Nummenmaa et al. (2014). A significant difference was found between the two groups, $x^2(4,N=309)=69.70$, $p<.001$.

Most risk aversive behaviour occurred in 26 % of the subjects by choosing the 40-40 € option that had expected value of 40. This was also the most selected option. Most risk-seeking behaviour occurred in 38 % of the respondents. This was sum of the individuals who chose either 120-0 € or 130-(-10) €. Both gambles' expected value stayed a stable 60. In-between gambles of 60-30 €, 80-20 €, and 100-10 €, with expected values of 45, 50, and 55 respectively, accumulated a total of 36 % of the responses. Another two-tailed paired-samples t-test was run to compare the risk and time preference results with Leonard et al.'s (2013). This test was run with the original, ungrouped risk and time preference variables. There was a significant difference in the risk preference scores for this survey and Leonard et al. (2013) conditions, $x^2(5,N=312)=34.23$, $p<0.001$. Concerning the time preference question, most replies indicated future bias (71 %), followed by time-consistency (26 %) and present bias (4 %). Chi-squared test of independence gave also a significant difference in the time preference scores for this survey and Leonard et al. (2013), $x^2(6,N=312)=129.67$, $p<0.001$. A detailed distribution of the risk and time preferences can be seen in appendix 5.

Statements considering risk-and time-related cognitive biases were transformed to summed scales (table 3). The summed scales distributed as follows: status quo (median=1.9, SD=1.2), habit (median=2.2, SD=1.3), loss aversion (median=1.1, SD=0.9), intertemporal choice (me-

dian=1.1, SD=1.0), and licensing effect (M=1.4, SD=0.7). Status quo statements were disagreed with 15 % of population in preparation stage and neither disagreed nor agreed with 13 % of population in action stage. Habit statements were agreed with 12 % of action subjects, neither disagreed nor agreed with 11 % of preparation subjects, and disagreed with 11 % of contemplation subjects. Loss aversion statements were disagreed with both action (17 %) and preparation subjects (15 %). Intertemporal choice was strongly disagreed among preparation (11 %) and action subjects (10 %) and disagreed among preparation (10 %) and action (10 %) subjects. Licensing effect was disagreed among preparation (18 %), action (14 %), and contemplation (12 %) subjects, and neither disagreed nor agreed among action (12 %) and preparation (10 %) subjects. Other responses were less than 10 % of the subjects, i.e. subjects in both maintenance and pre-contemplation stages had only single responses here and there. Full distribution of the summed scales can be seen in appendix 5.

OLR was the main data-analysing method (table 2). Metsämuuronen (2008) and Norusis (2012) explain how likelihood describes the relation of the actual model and the observation. A regular procedure is taking a logarithm of the likelihood and multiplying by -2. The smaller a value –2LL gets, the better the prediction is in line with reality. (Metsämuuronen 2008; Norusis 2012.) The intercept only model gave a result of 362.76, whereas the final model was 248.48. Chi-squared of the final model was 114.28 ($p<0.001$, df=17), which approves the use of explanatory variables as a significant improvement of information in comparison to the intercept model only. Bender and Grouven (1997) claim that a goodness-of-fit test ought to be one of the main criteria of choosing a study method. Goodness-of-fit test indicated that OLR fits for this study. Pearson Chi-squared test was 338.70 with a non-significant test result ($p=1$, df=495). Deviance Chi-squared was 248.48 with a non-significant test result ($p=1$, df=495).

Pseudo R-square test had somee variation in different tests. Coefficient of determination was 0.59 for Cox and Snell, 0.63 for Nagelkerke, and 0.32 for McFadden. Hanneman et al. (2013) and Metsämuuronen (2008) state that these tests indicate how much the OLR model predicts a dependent variable: the closer a value is to one, the more a model determines the observation. The pseudo R is claimed to be closer to the linear model R-square compared to the ordinary least squares model (Zumbo & Ochieng 2002). A direct interpretation should be avoided and rather understand the value as a heuristic evaluation tool (Nummenmaa 2009).

Parameter estimates (table 4) deal with each variable and calculate how well they determine the dependent variable PASC. Nominal variables, gender and highest level of education, were handled as factors. Scale and ordinal variables were handled as covariates following the example of i.e. Leonard et al. (2013) and Rapp (2012) and to get a better overall look due to the vast number of variables. A confidence interval of 95 % was used.

Parameter Estimates

		Esti-mate	Std. Error	Wald	df	Sig.	95% CI Lower Bound	95% CI Upper Bound	exp(ß)
Threshold	PASC=0	-0.455	3.350	0.018	1	0.892	-7.021	6.111	0.634
	PASC=1	3.581	3.312	1.169	1	0.280	-2.910	10.071	35.909
	PASC=2	6.408	3.357	3.644	1	0.056	-0.172	12.988	606.679
	PASC=3	8.904	3.396	6.873	1	0.009	2.247	15.561	7361.360
Location	Age	0.065	0.031	4.531	1	0.033	0.005	0.126	1.067
	BMI	-0.229	0.198	1.341	1	0.247	-0.617	0.159	0.795
	Sedentary	0.076	0.263	0.084	1	0.772	-0.439	0.591	1.079
	Risk	-0.173	0.252	0.468	1	0.494	-0.668	0.322	0.841
	Time	-0.065	0.381	0.030	1	0.864	-0.811	0.681	0.937
	Health	0.344	0.258	1.786	1	0.181	-0.161	0.849	1.411
	SQ	0.815	0.264	9.513	1	0.002	0.297	1.334	2.259
	H	1.012	0.263	14.823	1	0.000	0.497	1.526	2.751
	LA	-0.198	0.259	0.583	1	0.445	-0.705	0.310	0.820
	IT	-0.167	0.240	0.481	1	0.488	-0.638	0.305	0.846
	LE	0.062	0.282	0.048	1	0.826	-0.491	0.615	1.064
	Gender=0	0.373	2.333	0.026	1	0.873	-4.198	4.945	1.452
	Gender=1	0.013	2.342	0.000	1	0.996	-4.577	4.602	1.013
	Gender=2	0[a]	.	.	0	.	.	.	.
	Degree=0	-0.347	1.086	0.102	1	0.749	-2.475	1.782	0.707
	Degree=1	0.078	0.870	0.008	1	0.929	-1.627	1.783	1.081
	Degree=2	0.782	0.919	0.725	1	0.395	-1.019	2.584	2.186
	Degree=3	0.729	1.171	0.388	1	0.534	-1.566	3.025	2.073
	Degree=4	0[a]	.	.	0	.	.	.	.

Link function: Logit.

a. This parameter is set to zero because it is redundant.

Table 4: Parameter estimates of the ordered logistic regression

A parameter estimate ß expresses the effect of a unit change in a variable on the log odds with a significance level of $p<0.05$ (Hanneman et al. 2013; Norusis 2012). Positive sign indicates an increasing effect and negative a decreasing one (Nummenmaa 2009; Ketokivi 2015). The right-hand-side column of exponentiated estimates, or odds, were calculated manually and added to the table (Xiong et al. 2008; Agresti 2012). The exponentiated estimates are the actual odds of a unit change, or odds ratio, in comparison to the regression coefficients that give the log odd values (Metsämuuronen 2008; Norusis 2012; UCLA 2019a).

A Wald test was used for estimating suitability of parameters by dividing a parameter by its standard error and raising to a power: the test follows the Chi-squared distribution if the null hypothesis is valid (Metsämuuronen 2008; Norusis 2012). The Wald test pointed statistically significant results for three variables: age ($p=0.033$), status quo ($p=0.002$), and habit ($p<0.001$), and these values were exponentiated. Transformed into a linear regression formula, the exponentiated parameters are : $PASC = 0.634 + 1.07(age) + 2.26(SQ) + 2.75(H)$, where 0.634 is the PASC=0 value. Age is coded in years. Both status quo and habit are coded as 0=strongly disagree, 1=disagree, 2=neither disagree nor agree, 3=agree, and 4=strongly

agree. Participant's odds to advance in PASC increased 1.07 units for each age year, 2.26 units for a unit increase in status quo, and 2.75 units for a unit increase in habit. Other variables didn't have statistically significant results: gender, highest level of degree, BMI, sedentary behaviour, risk preference, time preference, perceived health, loss aversion, intertemporal choice, and licensing effect. 95 % confidence intervals were not provided by the program.

As a last part of the OLS, a test of parallel lines was conducted. According to Norusis (2012), this test is to verify the assumption that all the logits of this model are in the same relation to the independent variables. The null hypothesis assumes they are in line, whereas the general model tests if this model is an improvement to the null hypothesis. (Norusis 2012.) The null hypothesis of -2 log likelihood was 248.48 and the general model 210.07 with a subtraction of 38.41 at the significance level of p=0.90 (df=51). With a significance level this high, the null hypothesis shouldn't be rejected that the lines are parallel, and the general level doesn't improve the model too much (Norusis 2012).

The comparative data-analysing method was MLR to see if the estimates remained similar or obtained different results (table 2). As reflected earlier, there are reasons why linear regression analysis might be less suitable model for data that are mostly categorical: i.e. both dependent and independent variables ought to be continuous instead of ordinal (Ketokivi 2015). In case of ordinal variables, both McCormick, Salcedo and Poh (2015) and Nummenmaa (2009) recommend dummy coding. The full analysis was conducted without dummy coding thanks to the vast number of variables. This procedure was made intentionally and acknowledging it might violate the coefficient of determination. Dummy coding was still decided to conduct having analysed the whole data and statistically significant results. These results are described in the end of this section and in the appendices.

Because MLR was chosen as an assisting method and the dependent variables were prenominated, the SPSS algorithm method was kept standard multiple regression. Metsämuuronen (2008) states that excess multicollinearity might cause a problem in the data analysis (see also UCLA 2019b; Washington et al. 2011). To eliminate excessive occurrence of multicollinearity, tolerance and VIF values were evaluated in comparison to reference values given by Metsämuuronen (2008, 109; cf. Ketokivi 2015; Washington et al. 2011). Even with this procedure, some multicollinearity might still exist. Firstly, many of the individual variables had correlation on levels from 0.40 to 0.80, which interfere the estimation of parameters (Ketokivi 2015). Secondly, collinearity diagnostics gave one eigenvalue over ten that might be a serious condition of multicollinearity and therefore give an unstable result (Metsämuuronen 2008; Ketokivi 2015). Other dimensions were between zero and one.

Residuals are calculated by subtracting predicted values from expected values (Ketokivi 2015; Nummenmaa 2009). Nummenmaa (2009) specifies that a residual is that part of the Y variation that cannot be explained by the model. A normal P-P plot was produced for evaluating normal distribution of the residuals (appendix 6). An ocular estimate showed a mainly normally distribution, that is an assumption for a proper working linear regression model (Nummenmaa 2009). Appendix 6 shows also scatterplot of the distribution of residuals. The goal is to have as evenly distributed, or homoscedastic, residuals as possible (Metsämuuronen 2008). Residuals of this research could be interpreted homoscedastic, even if the volume increases somewhat as the values increase. Roughly, distribution of the residuals over and under zero is even that is a criterion given by Nummenmaa (2009).

R^2 explains how much all the independent variables determine the dependent variable in total (Hanneman et al. 2013). Values are between zero and one: the closer R^2 is to one, the more a model determines the dependent variable (Nummenmaa 2009). If the dependent variable is in any way considered complex, R^2 value is rarely close to one, and the error term ε obtains more weight (Ketokivi 2015). Adjusted R^2 takes in consideration the number of variables: a simple procedure of varying the number of variables doesn't affect directly on the calculated value (Nummenmaa 2009). Regression coefficient of determination were 0.60 for R^2 and 0.56 for adjusted R^2. Difference between the two R^2s wasn't too considerable, which indicates a reasonable number of variables in the model according to McCormick et al. (2015). A model might have a high R^2 value without any statistically significant variables. Therefore, ANOVA completes the regression model analysis (Nummenmaa 2009). This test is for measuring statistically significant connections between the dependent variable PASC and the independent variables in total: a statistically significant result rejects the null hypothesis, and one or more variables predict the dependent variable (McCormick et al. 2015). A significant regression was found: $R^2=0.597$, $F(13,115)=13.09$, $p<0.001$), which indicates a sufficient fit.

Linear regression coefficients are presented in table 5. A common way is to utilize the unstandardized coefficients (Nummenmaa 2009). Metsämuuronen (2008) recommends t-test as goodness-of-fit test for the coefficients. A t-test is a standard procedure, where a regression coefficient is divided by its variance. A reliable determinant is a t-value over 2.00 with a significance of $p<0.05$. (Metsämuuronen 2008; see also Nummenmaa 2009.)

Coefficients[a]

Model		Unst. Coefficients		St. Coefficients	t	Sig.	95 % CI for B		Collinearity Statistics	
		B	Std. Error	Beta			Lower Bound	Upper Bound	Tolerance	VIF
1	(Constant)	0.388	0.529		0.734	0.464	-0.659	1.436		
	Gender	-0.088	0.132	-0.043	-0.669	0.505	-0.349	0.173	0.864	1.157
	Degree	0.038	0.083	0.036	0.464	0.644	-0.126	0.203	0.584	1.712
	Age	0.023	0.010	0.174	2.293	0.024	0.003	0.044	0.608	1.644
	BMI	-0.074	0.067	-0.071	-1.102	0.273	-0.206	0.059	0.852	1.174
	Sedentary	0.013	0.089	0.010	0.150	0.881	-0.162	0.189	0.870	1.149
	Risk	-0.056	0.087	-0.043	-0.651	0.516	-0.228	0.115	0.789	1.267
	Time	0.009	0.131	0.004	0.066	0.947	-0.251	0.268	0.773	1.293
	Health	0.102	0.086	0.087	1.185	0.238	-0.068	0.271	0.658	1.519
	SQ	0.286	0.088	0.332	3.270	0.001	0.113	0.460	0.339	2.947
	H	0.353	0.085	0.428	4.158	0.000	0.185	0.522	0.331	3.017
	LA	-0.075	0.088	-0.067	-0.846	0.399	-0.250	0.100	0.557	1.794
	IC	-0.047	0.083	-0.045	-0.568	0.571	-0.212	0.117	0.551	1.815
	LE	0.028	0.094	0.019	0.295	0.768	-0.158	0.213	0.813	1.229

a. Dependent Variable: PASC.

Table 5: Linear regression coefficients

According to the linear regression analysis, the parameters of linear regression model formula are: $PASC = 0.39 + 0.02(age) + 0.29(SQ) + 0.35(H)$, where 0.39 is the constant value. Age is coded in years. Both status quo and habit are coded as 0=strongly disagree, 1=disagree, 2=neither disagree nor agree, 3=agree, and 4=strongly agree. Participant's PASC increased 0.02 units for each age year (p=0.024), 0.29 units for a unit increase in status quo (p=0.001), and 0.35 units for a unit increase in habit (p<0.001). 95 % confidence intervals were [0.00,0.04] for age, [0.11,0.46] for status quo, and [0.19,0.52] for habit.

Dummy coding was conducted to statistically significant variables according to Nummenmaa (2009). Dependent variable PASC and independent scaled variable age were kept identical. Variables status quo and habit were transformed to variables SQ(0-4) and H(0-4) according to the original values given. As anticipated, also a significant regression was found with the following determinations: R^2=.584, F(9,129)=20,08 p<0.001). Adjusted R^2 was 0.55. Statistically significant coefficients were age (β=0.02, p=0.01), SQ3 (β=0.64, p=0.005), SQ4 (β=0.85, p=0.009), H0 (β=-1.39, p<0.001), H1 (β=-0.98, p<0.001), and H2 (β=-0.42, p=0.025). SQ0, SQ2, and H4 didn't have statistical significance (p=0.562, p=0.064 and p=0.402 respectively). SQ1 and H3 were excluded by SPSS. Detailed results are viewable in appendix 7.

The model-processing method to study the data was SEM in order to refine the understanding of the previous results and build a final model (cf. Sniehotta et al. 2005). All statistically significant variables were placed in a SEM that estimated the regression parameters once again

but also visualized relationships between the variables. The SEM was conducted with Ωnyx that uses maximum likelihood for estimating parameters. In comparison to the original dataset used in previous analysis, one data row was deleted since it was missing information on these specific variables. Was the original dataset used, the software would have constantly informed on a possibility of biased results.

Ωnyx provided certain model-fit-evaluations that are presented next. Ketokivi (2015) encourages researcher to carefully select the chosen evaluation tests. X^2 that rejects the null hypothesis at the $p<0.05$ level is a common way of measuring the overall model fit (Hooper et al. 2008; Kline 2011; Metsämuuronen 2008). Ketokivi (2015) states that x^2 is the only statistically argumentative fit test that indicates unidimensionality. The final model provided a Chi-squared value of 1.40 (>0.05). Metsämuuronen (2008) and Wheaton, Muthén, Alwin, and Summers (1977) recommend evaluating the goodness of Chi-squared with a simple rule of thumb: dividing the x^2 by its degrees of freedom. The quotient should be less than 2.00, even if there is discussion on should the number be even 5.00. (Metsämuuronen 2008; Wheaton et al. 1977; Hooper et al. 2008; cf. Sniehotta et al. 2005.) The remainder was 1.40 (<2.00).

A comparative fit index (CFI) is a way of comparing a null Chi-squared model to the presented Chi-squared model (Metsämuuronen 2008; Ketokivi 2015). CFI is an improved version of the normed-fit index (NFI) since it accepts a relatively small sample size (Hooper et al. 2008). CFI should be minimum of 0.95 (Hooper et al. 2008; Metsämuuronen 2008). CFI was 1.00 for the final model. The root mean square error of approximation (RMSEA) is another way of telling the model fit by evaluating, how much the tested model differs from a perfect model (Metsämuuronen 2008). The best result is as small as possible: under 0.06 (Metsämuuronen 2008) or at least under 0.07 (Hooper et al. 2008). The RMSEA result was 0.05 for classic, df corrected and Kulback Leibler, which seemed to be acceptable according to both recommendations. Metsämuuronen (2008) and Hooper et al. (2008) point out another evaluation method: the root mean square residual (SRMR), which is calculated from the size of the estimated residuals. The aim is having as little as possible difference between the measured covariance and a theoretical covariance with a result of 0.08 or less (Metsämuuronen 2008; Hooper et al. 2008). Hooper et al. (2008) separately offer a value of maximum 0.05 to be good. Kline (2011) states that the result should be as close to zero as possible. Here the result was 0.05 that should be approved by any the former criteria.

The regression model is modelled in figure 1. A typical SEM is a combination of a measuring model and a structural model that illustrates the relationships between the latent variables and their variance in the measured variables (Nummenmaa 2009; Kline 2011). Yet, this model lacks any true latent variables. The observed variables were age, status quo, habit, and PASC.

The formula was completed with an error term and exogenous constant terms. A technical assumption for the error term is that it doesn't correlate with any other variables (Metsämuuronen 2008; Kline 2011; cf. Sniehotta et al. 2005) and that it is one-dimensional (Ketokivi 2015).

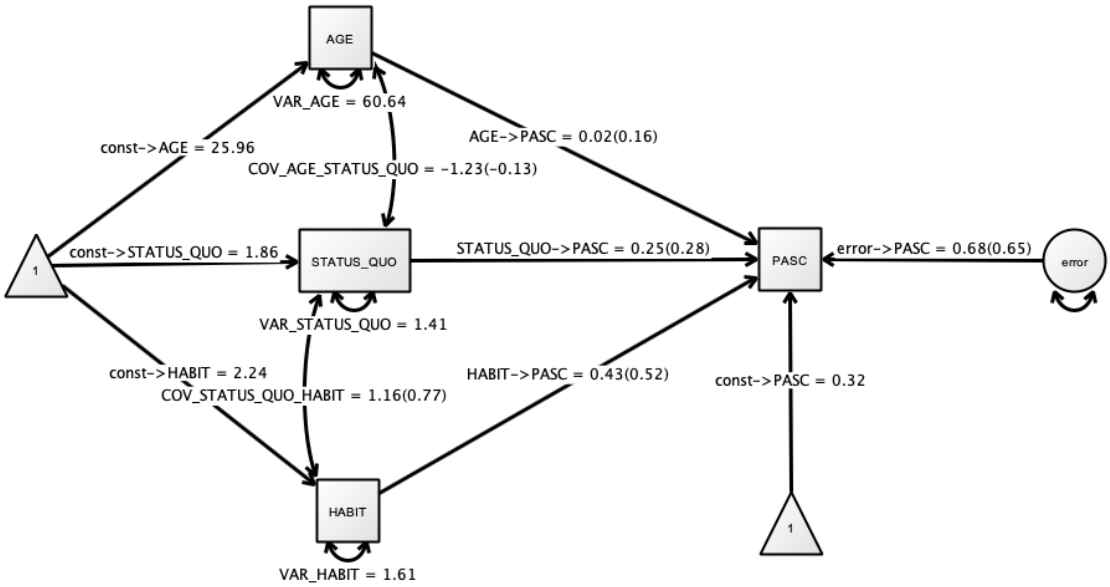


Figure 1: Multiple regression as a SEM

A larger version of figure 3 is available at the appendices section (appendix 8). The following appendix (9) includes frequencies and a correlation test. A Pearson correlation coefficient test approved that status quo bias correlates with both habit and age, yet, habit and age do not correlate with each other. Therefore, the covariance arrows aren't evenly distributed among all the variables but following the earlier test. The variance within PASC itself was removed, since the equation was completed with an error term. The regression equation was also supplemented with constant terms for mean values (Beaumont 2018).

R^2 and a parameter-specific t-test were conducted manually. Modification Index and observation-specific adequacy were left out intentionally due to the simplified results Ωnyx prints. Furthermore, two model comparisons were executed: F-test and p-value evaluations. These calculations and comparations are presented next respectively. Metsämuuronen (2008) recommends calculating the R^2 for each variable to validate the adequacy of measurement. Nevertheless, only a model-determining R-square was calculated due to the minimalistic information Ωnyx provides. Beaumont (2018) advises to use a simple formula that benefits from the error term and its standardized residual variance (SRV), even if there is a possibility for some rounding errors. SRV is retrieved from the path of the error term. In this case, SRV is 0.65^2, and hence the complete formula goes as following: $R^2 = 1 - 0.65^2 = 0.578$.

Therefore, 58 % of PASC's variance is explained by this model. This is 2 percentage points more compared to the linear regression result of 56 % that included 15 independent variables instead of the current 3-independent-variables model. T-test that measures adequacy is calculated by dividing parameter estimate by parameter standard error with a quotient of minimum 2.00 for a statistically significant result (Metsämuuronen 2008). All regression paths resulted above 2.00. Omnibus F-test was conducted by comparing the final SEM model with a zero model; regression lines were fixed to zero as Beaumont (2018) suggests. The F-test resulted a significance of p<0.001 (df=3). Also, p-values were obtained following the example of Beaumont (2018) by comparing the final SEM model with three separate models that each had a single regression line fixed to zero. P-values are added in table 6.

Parameter estimates

#	Name	From / To	Estimate	Std.error	t-test	p-value
0	variance Age	Age <-> Age	60.642	7.172		
1	variance SQ	SQ <-> SQ	1.412	0.165		
2	variance H	H <-> H	1.611	0.191		
3	Age -> PASC	Age --> PASC	0.021	0.008	2.825	0.005**
4	SQ -> PASC	SQ --> PASC	0.247	0.078	3.182	0.002**
5	H -> PASC	H --> PASC	0.430	0.072	5.988	0.000***
6	error -> PASC	error --> PASC	0.680	0.041		
7	cov. Age <-> SQ	SQ <-> Age	-1.234	0.513		
8	cov. SQ <-> H	H <-> SQ	1.157	0.158		
9	const -> Age	mean Age	25.958	0.651		
10	const -> SQ	mean SQ	1.864	0.100		
11	const -> H	mean H	2.245	0.106		
12	const -> PASC	mean PASC	0.322	0.239		

***. p<0.001

**. p<0.01

Table 6: Final model parameters with an additional t-test

Having located the parameters to the final formula, the SEM-based regression model is now: $PASC = 0.32 + 0.02(age) + 0.25(SQ) + 0.43(H) + 0.68(error)$, where 0.32 is constant. Age is coded in years. Both status quo bias and habit are coded as 0=strongly disagree, 1=disagree, 2=neither disagree nor agree, 3=agree, and 4=strongly agree. Participant's PASC increased 0.02 units for each age year (p=0.005), 0.25 units for a unit increase in status quo (p=0.002), and 0.43 units for a unit increase in habit (p<0.001). A nominal error term is 0.68. Confidence intervals were not provided by the program.

5 Discussion on this physical activity report

This final section concludes the earlier sections in a synthesis and bases more on the author's own reasoning that was formed from the current literature and this research on physical activity. There are also suggestions for further research that would form a logical continuum. Lastly, ethical considerations of this research are reflected on.

5.1 Key takeaways on understanding economic preferences and physical activity

The scope of this study was to detect the causality between subjects' economic preferences with weekly PASC. This study focused on individuals' risk and time preferences, in addition their possible risk- and time-related cognitive biases in status quo, habit, loss aversion, intertemporal choice, and licensing effect. Direct statistically significant ($p<0.05$) causality existed with three variables: age, status quo bias, and habit. All three variables' coefficients were positive as PASC increased towards maintenance stage. Logistic regression as the best-suitable method gave parameter estimates with most variation (table 4). Linear regression and the refined SEM estimated relatively similar coefficients (table 5; figure 3). In general, age had the most modest effect, status quo a mediocre effect, and habit the most influential effect.

There wasn't statistical significance with other background variables that were gender, highest degree, and BMI. Variables in the health domain, sedentary behaviour and perceived health, didn't have a statistical significance either. Risk and time preferences, which were earlier proven to be in a causal relation with PASC (Leonard et al. 2013), didn't have a statistically significant causality in this study. Lastly, three other risk- and time-related cognitive biases loss aversion, intertemporal choice, and licensing effect were not causally connected. All results were validated with both OLR and MLR (table 2; table 5). The final regression model was built as a SEM (figure 3).

Result of this study verified age as a significant factor advancing the PASC, but generally there are varying results on age connecting with physical activity and other health behaviours among researchers (Garber et al. 2008; Riebe et al. 2005; Dumith et al. 2007; c.f. Anderson & Mellor 2008). All this could depend on i.e. used age range, methods of studying, and the specific health domain that is the study objective, too. However, if age raises the likelihood of being physically active, should the advocacy start among the youth. Earlier research supports higher degree as a predictor of higher physical activity (Dumith et al. 2007). Most of the subjects in this study had either high school or vocational school as their highest degree, and frequencies in both university categories were rather low (appendix 5). This might explain non-significant results for education as a determinant. Neither gender nor BMI brought up significant causality with PASC. Previous studies have varied results on both gender (Garber et al. 2008; Walton et al. 1999; cf. Patterson et al. 2006; Plotnikoff et al. 2010) and weight status (Garber et al. 2008), but there doesn't seem to exist any strong evidence for either side.

Better perceived health was a proxy for PASC in Dumith et al. (2007), whereas in this study it wasn't. Neither was sedentary behavior. Perhaps, perceived health is too a subjective and non-standardized question. There is always a possibility for misunderstandings and personal interpretations as Ketokivi (2015), Nummenmaa (2009), and Pahkinen (2012) all suggest. For example, subjects in Leonard et al. (2013) perceived their health status mostly good or very good despite that 72 % were overweight or obese. In the Finnish culture, subjects might think their health more critically and connect obesity with a lower perceived health. Results from sedentary behavior might be somewhat drastic. It might be that despite sitting longer hours, some have more established physical activity habits. Alas, even if one was physically active in the standard of recommended weekly guidelines, they would stand still for long hours which still leads to a weakening overall health as Kolu and Vasankari (2018) state. There are plenty of available hours outside the weekly guidelines to spend in a sedentary manner.

These results join a thin continuum of not finding significant results with financial risk and time preferences in the health domain (Conell-Price & Jamison 2015; Anderson & Mellor 2008; Khwaja et al. 2006), whereas i.e. Leonard et al. (2013), Coppola (2014), and Shuval et al. (2015; 2017) have found significant connections. Though, it should be noted that the whole health domain is vast and fragmented, and a deep focus on physical activity is still waiting for its proper ravelling through economic preference lenses. The type of study that was conducted by Leonard et al. (2013) hasn't been repeated as such to the author's knowledge.

Significant results on status quo bias and habit verify the importance of establishing routines around aimed behaviour, and preferably in the younger age. Initializing a habit of physical activity is crucial. As crucial is maintaining that habit and making the habit a prevailed state—a status quo. Other studied biases, loss aversion, intertemporal choice, and licensing effect didn't connect with PASC significantly. What should be noted is that out of these three non-significant biases, only loss aversion statements were completely cohesive correlation-wise, which indicates improving the survey considering the time-related statements for further studies. An assumption was that individuals make present-biased cost-benefit analyses of being physically active. Either they don't or the benefits of exercise overcome these battles. Maybe after all, the cost of time or competing activities doesn't feel like sacrifice in comparison to the immediate or future benefits physical activity creates. Licensing effect might exist with some individuals but not link causally to physical activity routines.

The objective for this study was to build a model of the factors that have a causal effect on PASC among the case company employees. The final model consisted of variables age, status quo, and habit (figure 3). Based on the model, PASC increase as the employees get older. Perhaps, age and therefore experience create an understanding of how being physically active benefits an individual in the future. This way, despite that neither patience nor impatience were causally linked with PASC, older age could be a proxy for thinking more about the long-

term health benefits and performance. Whereas younger individuals might feel immortality and endless stamina without putting any systematic effort on their physical fit, the older may not. Another explanation could be a steadier and more settled lifestyle as people get older with established physical activity routines too. Life can be more about sticking with everyday manners instead of spontaneous adventures and constant variation, when one ages.

This thought would support the idea of other significant variables in the model too. The most advanced PASC, action and maintenance, are about prevailing physical activity habits. Status quo and habit describe a similar phenomenon in a sense, even if there exists a profound difference. Status quo bias is more about prevailing, what is happening now, and avoiding general risks and uncertainty even if that means doing nothing (Samuelson & Zeckhauser 1988). It could be described also staying in a person's comfort zone. If that comfort zone is built around physical activity, it's only natural that there are steady habits of being physically active. Then again, habits are more automatic processes in one's everyday behaviour (Dolan et al. 2012; Gardner et al. 2012). This automatism could include being physically active by nature or by once-incentivized-yet-now-routinized behaviour.

The employer company could utilize this information by targeting especially the younger employees, who might still lack of established activity routines or a future-benefits perspective. The case organization could initialize and even incentivize workplace-related physical activity routines to create automatic habits that later would become status quo. An employee can't reach its power to all aspects of a person's life, but the spark to physical activity might be born at the worksite and then spread from there. There is neither any definitive consensus for what works nor one-size-fits-for-all solution for increasing physical activity among individuals. Instead, there must be a selection of different means that fit different individuals.

One mean in increasing physical activity is supportive labour and workplace policies (World Health Organization 2018). There have been also promising results on giving subjects the power to choose the order of the exercise as a significant motivator, even if physical activity itself was compulsory (Wulf, Freitas & Tandy 2014). Garnder et al. (2012) highlight that individual should maintain as much autonomy as possible for a better commitment and get used to small and manageable habits. Conell-Price and Jamison (2015; c.f. Sniehotta et al. 2005) accent individual's self-efficacy or internal locus of control that should be an important determinant. Charness and Gneezy (2009) in turn discovered that physical activity habits were initialized with monetary incentives, yet later merged into a non-incentivized routine. All this should be taken in consideration when creating physical activity initiatives for individuals. Leonard and Shuval (2017) address that paternalizing is not the efficient way to encourage in physical activity but nudging or altering the decision environment might be the key. They state that active lifestyle should be the easiest option to choose, and yet, the power to choose would remain with the individual. (Leonard & Shuval 2017.)

Shuval et al. (2015) suggest that to help people achieving their physical activity guidelines better, recognizing their economic preferences better could guide towards the right motivational tools (cf. Milkman et al. 2008; Leonard & Shuval 2017). Simply recognizing one's own naïvete, consistency, or sophistication of temporal decisions could lead the way for different means of motivating (O'Donoghue & Rabin 1999). Shuval et al. (2015) give examples on motivational means: pre-commitment to physical activity, decreasing monetary and time-related loss aversion that come up in the decision-making moment, and bringing exercise equipment available for everyone. All these are supportive tools, but certain means might work better with certain type of people. Some people might need more future-oriented decision-making, i.e. committing for a certain longer period of physical activity, even with a sanction of not meeting the goal, and other might need more prompt decisions that make each decision situation lean towards engaging physical activity.

5.2 Further economic preferences and physical activity stages of change research

There are a few suggestions for a possible follow-up research. A simple follow-up would be conducting a similar survey after a period to compare the results and continue with a test-retest tradition. Was there a regular survey on physical activity habits, the survey itself could work as a prompt for starting a more active lifestyle in some cases. This could be hypothesized at least. Another continuum would be conducting this study's setup as a field experiment. This would include financially incentivized gambles and handing out real money either now or after six months. Subjects could wear pedometers, heart rate monitors, or other devices that measure objective physical activity. They could evaluate their own overall perceived health and PASC before and after as a comparison between different means of monitoring. Statements that inquired subjects on their PASC and possible risk- or time-related cognitive biases should be re-evaluated in the light of correlations and reliability in order to find cohesive statements on individual biases. After pretesting, these statements could be surveyed in the beginning and in the end of an experiment with a retrospective pair testing.

To create an even more robust field test, the afore-described setup could be conducted in a form of randomized controlled trial. This setup could include a risk group, a temporal group, and a control group. Control group would receive prizes based on their economic preferences. Their physical activity would be monitored along the test period, but there wouldn't be any connection between the prizes and the monitoring. Risk group subjects could choose one from a set of gambles and bet on their success of meeting weekly physical activity guidelines. Success and failure of meeting the guidelines would be valued according a subject's choice, from a very risk-aversive to risk-seeking options. Temporal group would be incentivized for physical activity either now or after a certain period. They would receive prizes for keeping up with the guidelines. They should choose receiving an immediate reward or a reward with interest after the field test period.

5.3 Ethical considerations for this physical activity report

Ethical considerations of this study followed the code of practice by Thesis Guidelines for University of Applied Sciences Master's degrees (2019), Rectors' Conference of Finnish Universities of Applied Sciences Arene (2018), Hirsjärvi et al. (2016), and Finnish National Board on Research Integrity (2012) which focus on research integrity and honesty. The board defines integrity both ethical responsibility and consideration of a research process following its noble purposes. Honesty by their definition is not leaving space for fraud, plagiarism nor dishonesty along the process. Outside this restriction are i.e. matters of opinion or professional ethics issues. (Finnish National Board on Research Integrity 2012.)

This study was conducted with integrity, carefulness, and the most precision during preliminary preparations, surveying, and data post-treatment, as advised by the Finnish National Board on Research Integrity (2012). Research plan, study process, and some versions of the thesis were shared and brainstormed with the thesis instructor. Thesis language was consulted with professors at Laurea. References were marked duly following the examples of Hirsjärvi et al. (2016) and King (2013) by paying homage to the original works and authors. Direct quotes and references were marked with citation marks and page numbers; other more general references were noted with the correct author and work. The whole study was reported as thoroughly as possible in view of upcoming reviews or meta-analyses. Earlier studies were cited objectively (Finnish National Board on Research Integrity 2012).

Methodology was conducted based on the study practices in behavioural sciences for obtaining critical professional knowledge and reasoning ability in behavioural sciences (Finnish National Board on Research Integrity 2012; Thesis Guidelines for University of Applied Sciences Master's degrees 2019). A vast reflection on validity and a proper test of reliability were documented. Was there any accidental misinterpretation of results, that would be then considered a researcher's shortcoming (Finnish National Board on Research Integrity 2012; Rectors' Conference of Finnish Universities of Applied Sciences Arene 2018). The survey was targeted at adults, and there wasn't any physical intervention or strong stimuli conducted (National Advisory Board on Research Ethics 2009). Subjects were recommended but not obligated to answer. Neither rewards nor fines were given based on individual’s answering behaviour. The survey itself didn’t include any obligatory questions, which made answering blank possible. This was informed to the subjects in the beginning of the survey. More up-front information to the subjects was about the topic of the research, researcher’s contact information, estimated temporal length of responding, and data privacy (National Advisory Board on Research Ethics 2009). Contact information was given with an encouragement to contact the researcher if any hesitation. One subject contacted the researcher, and they were given a direct answer as the National Advisory Board on Research Ethics (2009) recommends.

Raw data were handled anonymously from the beginning and processed by the researcher only (cf. Rectors' Conference of Finnish Universities of Applied Sciences Arene 2018). Results were presented from the data mass only. Raw data are solely owned by the researcher and are held on a globally renown cloud service on the researcher's personal, paid account. A backup copy is stored on the researcher's external hard disk. One consideration is that subjects might be recognized based on the individual measures and age information; this is why the data are saved until the thesis and a possible complimentary article are published and then destroyed afterwards (National Advisory Board on Research Ethics 2009).

Case company staff were instructed on respecting subjects' privacy by giving each subject solitude answering the survey. No raw data were given to any third parties, not even the case company. Neither were any unfinished results published. None of the results were taken from researcher's earlier work either. Completed study results would be distributed open for public in Theseus following a responsible conduct of research (Finnish National Board on Research Integrity 2012; Rectors' Conference of Finnish Universities of Applied Sciences Arene 2018). Results were also presented for a teacher-student panel at the university of applied sciences and the case company leadership in separate events. Suggestions were made based on the study results. Researcher worked as a staff member during the research process at the case company but was on childcare allowance during the survey period—hence not receiving wage nor any fringe benefits. All liabilities are enumerated in this chapter as proper research conduct requires (Finnish National Board on Research Integrity 2012; Rectors' Conference of Finnish Universities of Applied Sciences Arene 2018). In addition, a separate loyalty contract was made between the researcher and the case company as suggested by Rectors' Conference of Finnish Universities of Applied Sciences Arene (2018). Thesis author was granted a total of 1300 euros from two independent trust funds.

References

Printed sources

Acland, D. & Levy, M. 2013. Naivete, projection bias, and habit formation in gym attendance. Social Science Research Network working paper series, 1-52.

Anderson, L. R. & Mellor, J. M. 2008. Predicting health behaviors with an experimental measure of risk preference. Journal of Health Economics 27 (5), 1260-1274.

Bayer, Y. M., Shtudiner, Z., Suhorukov, O. & Grisaru, N. 2019. Time and risk preferences, and consumption decisions of patients with clinical depression. Journal of Behavioral and Experimental Economics 78 (C), 138-145.

Bender, R. & Grouven, U. 1997. Ordinal Logistic Regression in Medical Research. Journal of the Royal College of Physicians of London 31 (5), 546-551.

Bezyak, J. L., Berven, N. L. & Chan, F. 2011. Stages of Change and Physical Activity Among Individuals With Severe Mental Illness. Rehabilitation Psychology 56 (3), 182-190.

Camerer, C., Babcock, L., Loewenstein, G. & Thaler, R. 1997. Labor Supply of New York City Cabdrivers: One Day at a Time. The Quarterly Journal of Economics 112 (2), 407-441.

Charness, G. & Gneezy, U. 2009. Incentives to Exercise. Econometrica 77 (3), 909-931.

Chekroud, S., Gueorguieva, R., Zheutlin, A., Paulus, M., Krumholz, H., Krystal, J. & Chekroud, A. 2018. Association between physical exercise and mental health in 1·2 million individuals in the USA between 2011 and 2015: a cross-sectional study. The Lancet Psychiatry 0366 (18), 1-7.

Conell-Price, L. & Jamison, J. 2015. Predicting health behaviors with economic preferences & locus of control. Journal of Behavioral and Experimental Economics 54 (C), 1-9.

Coppola, M. 2014. Eliciting risk-preferences in socio-economic surveys: How do different measures perform? The Journal of Socio-Economics 48 (C), 1-10.

Deck, C. & Jahedi, S. 2015. An experimental investigation of time discounting in strategic settings. Journal of Behavioral and Experimental Economics 54 (C), 95-104.

Diamond, P. & Vartiainen, H. (eds.) 2007. Behavioral Economics and Its Applications. New Jersey: Princeton University Press.

DiClemente, C. C., Prochaska, J. O., Fairhurst, S. K., Velicer, W. F., Velasquez, M. M. & Rossi, J. S. 1991. The Process of Smoking Cessation: An Analysis of Precontemplation, Contemplation, and Preparation Stages of Change. Journal of Consulting and Clinical Psychology 59 (2), 295-304.

Dohmen, T., Falk, A., Huffman, D., Sunde, U., Schupp, J. & Wagner, G. G. 2005. Individual Risk Attitudes: New Evidence from a Large, Representative Experimentally-Validated Survey. IZA Discussion Paper 1730, 1-56.

Dohmen, T., Falk, A., Huffman, D., Sunde, U., Schupp, J. & Wagner, G. G. 2011. Individual risk attitudes: Measurement, determinants, and behavioral consequences. Journal of the European Economic Association 9 (3), 522-550.

Dolan, P., Hallsworth, M., Halpern, D., King, D., Metcalfe, R. & Vlaev, I. 2012. Influencing behaviour: The mindspace way. Journal of Economic Psychology 33 (1), 264-277.

Dul, J. & Hak, T. 2008. Case Study Methodology in Business Research. Oxford: Butterworth-Heinemann.

Dumith, S. C., Gigante, D. P. & Domingues, M. R. 2007. Stages of change for physical activity in adults from Southern Brazil: a population-based survey. International Journal of Behavioral Nutrition and Physical Activity 4 (1), 25.

Ert, E. & Haruvy 2017. Revisiting risk aversion: Can risk preferences change with experience? Economic Letters 151 (C), 91-95.

Faralla, V., Novarese, M. & Ardizzione, A. 2017. Framing effects in intertemporal choice: A nudge experiment. Journal of Behavioral and Experimental Economics 71 (C), 13-25.

Frank, R. G. 2007. Behavioral Economics and Health Economics. In: Diamond, P. & Vartiainen, H. (eds.) Behavioral Economics and Its Applications. New Jersey: Princeton University Press, 195-222.

Garber, C. E., Allsworth, J. E., Marcus, B. H., Hesser, J. & Lapane, K. L. 2008. Correlates of the Stages of Change for Physical Activity in a Population Survey. American Journal of Public Health 98 (5), 897-904.

Gardner, B., Lally, P. & Wardle, J. 2012. Making health habitual: the psychology of 'habit-formation' and general practice. British Journal of General Practice 62 (605), 664-666.

Golsteyn, B. H. H., Grönqvist, H. & Lindahl, L. 2014. Adolescent Time Preferences Predict Lifetime Outcomes. The Economic Journal 124 (580), F739-F761.

Haas, S. & Nigg, C. R. 2009. Construct validation of the stages of change with strenuous, moderate, and mild physical activity and sedentary behaviour among children. Journal of Science and Medicine in Sport 12 (5), 586-591.

Hanoch, Y., Barnes, A. J. & Rice, T. (eds.) 2017. Behavioral Economics and Healthy Behaviors. Key Concepts and Current Research. New York: Routledge.

Harrison, G. W., Johnson, E., McInnes, M. M. & Rutström, E. E. 2005. Temporal stability of estimates of risk aversion. Applied Financial Economics Letters 1 (1), 31-35.

Hertwig, R. & Ortmann, A. 2001. Experimental practices in economics: A methodological challenge for psychologists? Behavioral and Brain Sciences 24 (3), 383-451.

Hessami, Z. & Resnjanskij, S. 2019. Complex ballot propositions, individual voting behavior, and status quo bias. European Journal of Political Economy 58, 82-101.

Hirsjärvi, S., Remes, P. & Sajavaara, P. 2016. Tutki ja kirjoita, 21st edition. Helsinki: Tammi Publishers.

Holopainen, M. & Pulkkinen, P. 2013. Tilastolliset menetelmät. 5th—8th edition. Helsinki: Sanoma Pro.

Holopainen, M., Tenhunen, L & Vuorinen, P. 2004. Tutkimusaineiston analysointi ja SPSS. Järvenpää: Yrityssanoma.

Holt, C. & Laury, S. 2002. Risk Aversion and Incentive Effects. The American Economic Review 92 (5), 1644-1655.

Hooper, D., Coughlan, J. & Mullen, M. 2008. Structural Equation Modelling: Guidelines for Determining Model Fit. Electronic Journal of Business Research Methods 6 (1), 53-60.

Howard, G. 2016. On linking risk preferences and time preferences when estimating incentive effects. Economic Letters 143 (C), 87-89.

Husu, P., Jussila, A-M., Tokola, K, Vähä-Ypyä, H. & Vasankari, T. 2016. Objektiivisesti mitattu paikallaanolo ja liikkuminen. In: Kokko, S. & Mehtälä, A. (eds.) Lasten ja nuorten liikuntakäyttäytyminen Suomessa. LIITU-tutkimuksen tuloksia 2016. Valtion liikuntaneuvoston julkaisuja 2016:4, 16-22.

Husu, P., Sievänen, H., Tokola, K., Suni, J., Vähä-Ypyä, H., Mänttäri, A. & Vasankari, T. 2018. Suomalaisten objektiivisesti mitattu fyysinen aktiivisuus, paikallaanolo ja fyysinen kunto. A publication of Ministry of Culture and Education 2018:30.

Israel, A., Rosenboim, M. & Shavit, T. 2014. Using priming manipulations to affect time preferences and risk aversion: An experimental study. Journal of Behavioral and Experimental Economics 53, 36-43.

Jones, M. 2014. Researching Organizations. The Practice of Organizational Fieldwork. Thousand Oaks: SAGE Publications.

Kahneman, D. & Tversky, A. 1979. Prospect Theory: An Analysis of Decision Under Risk. Econometrica 47 (2), 263-291.

Kang, M.-I. & Ikeda, S. 2016. Time discounting, present biases, and health-related behaviors: Evidence from Japan. Economics & Human Biology 21 (C), 122-136.

Kazdin, A. 1981. Drawing valid inferences from case studies. Journal of Consulting and Clinical Psychology 49 (2), 183-192.

Ketokivi, M. 2015. Tilastollinen päättely ja tieteellinen argumentointi. Helsinki: Gaudeamus.

Khan, U. & Dhar, R. 2006. Licensing Effect in Consumer Choice. Journal of Marketing Research 43 (29), 259-266.

Khwaja, A., Silverman, D. & Sloan, F. 2006. Time preference, time discounting, and smoking decisions. National Bureau of Economic Research Working Paper 12615, 1-38.

Kirk, A., MacMillan, F. & Webster, N. 2010. Application of the Transtheoretical model to physical activity in older adults with Type 2 diabetes and/or cardiovascular disease. Psychology of Sport and Exercise 11 (4), 320-324.

Kokko, S. & Mehtälä, A. (eds.) 2016. Lasten ja nuorten liikuntakäyttäytyminen Suomessa. LIITU-tutkimuksen tuloksia 2016. Valtion liikuntaneuvoston julkaisuja 2016:4.

Kokko, S., Mehtälä, A., Villberg, J., Ng, K. & Hämylä, R. 2016. Itsearvioitu liikunta-aktiivisuus, istuminen ja ruutuaika sekä liikkumisen seurantalaitteet ja -sovellukset. In: Kokko, S. & Mehtälä, A. (eds.) Lasten ja nuorten liikuntakäyttäytyminen Suomessa. LIITU-tutkimuksen tuloksia 2016. Valtion liikuntaneuvoston julkaisuja 2016:4, 10-15.

Kolu, P. & Vasankari, T. 2018. Käsitteiden määrittely. In: Vasankari, T. & Kolu, P. (eds.) Liikkumattomuuden lasku kasvaa - vähäisen fyysisen aktiivisuuden ja heikon fyysisen kunnon yhteiskunnalliset kustannukset. Huhtikuu 2018. Valtioneuvoston selvitys- ja tutkimustoiminnan julkaisusarja 31/2018, 6.

Kolu, P., Vasankari, T. & Raitanen, J. 2018. Kroonisten kansansairauksien kustannukset. In: Vasankari, T. & Kolu, P. (eds.) Liikkumattomuuden lasku kasvaa - vähäisen fyysisen aktiivisuuden ja heikon fyysisen kunnon yhteiskunnalliset kustannukset. Huhtikuu 2018. Valtioneuvoston selvitys- ja tutkimustoiminnan julkaisusarja 31/2018, 15-21.

Komlos, J., Smith, P. K. & Bogin, B. 2004. Obesity and the rate of time preference: Is there a connection? Journal of Biosocial Science 36 (2), 209-219.

Kosteas, V. D. 2015. Physical activity and time preference. International Journal of Health Economics and Management 15 (4), 361- 386.

Laine, M., Bamberg, J. & Jokinen, P. (eds.) 2007. Tapaustutkimuksen taito. Helsinki: Gaudeamus University Press.

Laine, M., Bamberg, J. & Jokinen, P. 2007. Tapaustutkimuksen käytöntö ja teoria. In: Laine, M., Bamberg, J. & Jokinen, P. (eds.) Tapaustutkimuksen taito. Helsinki: Gaudeamus University Press, 9-38.

Leonard, T. & Shuval, K. 2017. Behavioral Economics: Tools for Promotion of Physical Activity. In: Hanoch, Y., Barnes, A. J. & Rice, T. (eds.) Behavioral Economics and Healthy Behaviors. Key Concepts and Current Research. New York: Routledge, 70-89.

Leonard, T., Shuval, K., de Oliveira, A., Skinner, C.S., Eckel, C. & Murdoch, J. 2013. Health Behavior and Behavioral Economics: Economic Preferences and Physical Activity Stages of Change in a Low-Income African-American Community. American Journal of Health promotion 27 (4), 211-221.

Malmsten, A. 2007. Rajaaminen. In: Laine, M., Bamberg, J. & Jokinen, P. (eds.) Tapaustutkimuksen taito. Helsinki: Gaudeamus University Press, 57-73.

Marcus, B. H., Rossi, J. S., Selby, V. C., Niaura, R. S. & Abrams, D. B. 1992. The Stages and Processes of Exercise Adoption and Maintenance in a Worksite Sample. Health Psychology 11 (6), 386-395.

Metsämuuronen, J. 2008. Monimuuttujamenetelmien perusteet. 2nd edition. Helsinki: International Methelp.

Milkman, K. L., Rogers, T. & Bazerman, M. H. 2008. Harnessing Our Inner Angels and Demons. What We Have Learned About Want/Should Conflicts and How That Knowledge Can Help Us Reduce Short-Sighted Decision Making. Perspectives on Psychological Science 3 (4), 324-338.

Miura, T. 2019. Does time preference affect smoking behavior? A dynamic panel analysis. Journal of Behavioral and Experimental Economics 78 (C), 170-180.

Monin, B. & Miller, D. T. 2001. Moral Credentials and the Expression of Prejudice. Journal of Personality and Social Psychology 81 (1), 33-43.

Norusis, M. 2012. IBM SPSS Statistics 19 Advanced Statistical Procedures Companion. London: Prentice Hall.

Nummenmaa, L. 2009. Käyttäytymistieteiden tilastolliset menetelmät. 1st revised edition. Helsinki: Tammi Publishers.

Nummenmaa, L., Holopainen, M. & Pulkkinen, P. 2014. Tilastollisten menetelmien perusteet. Helsinki: Sanoma Pro.

O'Donoghue, T. & Rabin, M. 1999. Doing it Now or Later. The American Economic Review 89 (1), 103-124.

Pahkinen, E. 2012. Kyselytutkimusten otantamenetelmät ja aineistoanalyysi. Jyväskylä: Jyväskylä University Printing House.

Patterson, E., McGeough, D., Cannon, E., Hagströmer, M., Bergman, P., Kearney, J. & Sjöström, M. 2006. Self-efficacy, stages of change and physical activity in Irish college. Journal of Public Health 14 (2), 81-86.

Plotnikoff, R. C., Lippke, S., Johnson, S. T. & Courneya 2010. Physical Activity and Stages of Change: A Longitudinal Test in Types 1 and 2 Diabetes Samples. Annals of Behavioral Medicine 40 (2), 138-149.

Post, T., van den Assem, M. J., Baltussen, G. & Thaler, R. H. 2008. Deal or No Deal? Decision Making under Risk in a Large-Payoff Game Show. American Economic Review 98 (1), 38-71.

Prinsen, S., Evers, C. & de Ridder, D. T. D. 2019. Justified indulgence: self-licensing effects on caloric consumption. Psychology & Health 34 (1), 24-43.

Prochaska, J. O. & DiClemente, C. C. 1983. Stages and Processes of Self-Change of Smoking: Toward and Integrative Model of Change. Journal of Consulting and Clinical Psychology 51 (3), 390-395.

Rapp, K. E. 2012. Regression Methods for Categorical Dependent Variables: Effects on a Model of Student College Choice. PhD. Indiana University.

Riebe, D., Garber, C. E., Rossi, J. S., Greaney, M. L., Nigg, C. R., Lees, F. D., Burbank, P. M. & Clark, P. G. 2005. Physical Activity, Physical Function, and Stages of Change in Older Adults. American Journal of Health Behavior 29 (1), 70-80.

Ronkainen, S., Pehkonen, L, Lindblom-Ylänne, S. & Paavilainen, E. 2011. Tutkimuksen voimasanat. Helsinki: WSOYpro.

Rosenkilde, M., Auerbach, P., Reichkendler, M. H., Ploug, T., Stallknecht, B. M. & Sjödin, A. 2012. Body fat loss and compensatory mechanisms in response to different doses of aerobic exercise—a randomized controlled trial in overweight sedentary males. American journal of physiology: Regulatory, integrative and comparative physiology 303 (6), R571-R579.

Samuelson, W. & Zeckhauser, R. 1988. Status Quo Bias in Decision Making. Journal of Risk and Uncertainty 1 (1), 7-59.

Scott, S. C., Goldberg, M. S. & Mayo, N. E. 1997. Statistical Assessment of Ordinal Outcomes in Comparative Studies. Journal of Clinical Epidemiology 50 (1), 45-55.

Shuval, K., Drope, J., Stoklosa, M., Yaroch, A. L., Pachucki, M. C. & Harding, M. 2017. Time Preferences and Physical Activity: Insights from Behavioral Economics. Health Behavior and Policy Review 4 (1), 53-59.

Shuval, K., Si, X., Nguyen, B. & Leonard, T. 2015. Utilizing Behavioral Economics to Understand Adherence to Physical Activity Guidelines Among a Low-Income Urban Community. Journal of Physical Activity and Health 12 (7), 947-953.

Smith P. K., Bogin, B. & Bishai, D. 2005. Are time preference and body mass index associated? Evidence from the National Longitudinal Survey of Youth. Economics of Human Biology 3 (2), 259–270.

Sniehotta, F. F., Scholz, U. & Schwarzer, R. 2005. Bridging the intention-behaviour gap: Planning, self-efficacy, and action control in the adoption and maintenance of physical exercise. Psychology and Health 20 (2), 143-106.

Stoklosa, M., Shuval, K., Jeffrey, D., Tchernis, R., Pachucki, M., Yaroch, A. & Harding, M. 2018. The intergenerational transmission of obesity: The role of time preferences and self-control. Economics and Human Biology 28 (C), 92-106.

Sudgen, R. 2017. Do people really want to be nudged towards healthy lifestyles? International Review of Economics 64 (2), 113-123.

Suomen Telecenter Oy. 2018. Financial statement 1.1.-31.12.2017, 1-5.

Tavakol, M. & Dennick, R. 2011. Making Sense of Cronbach's Alpha. International Journal of Medical Education 2, 53-55.

Tversky, A. & Kahneman, D. 1991. Loss Aversion in Riskless Choice: A Reference-Dependent Model. The Quarterly Journal of Economics 106 (4), 1039-1061.

Tversky, A. & Kahneman, D. 1992. Advances in Prospect Theory: Cumulative Representation of Uncertainty. Journal of Risk and Uncertainty 5 (4), 297-323.

U.S. Department of Health and Human Services. 2018. Physical Activity Guidelines for Americans. 2nd edition. Washington D.C.: U.S. Department of Health and Human Services.

Valli, R. (ed.) 2018. Ikkunoita tutkimusmetodeihin. 5th revised edition. Jyväskylä: PS-Kustannus.

Vasankari, T. & Kolu, P. (eds.) 2018. Liikkumattomuuden lasku kasvaa - vähäisen fyysisen aktiivisuuden ja heikon fyysisen kunnon yhteiskunnalliset kustannukset. Huhtikuu 2018. Valtioneuvoston selvitys- ja tutkimustoiminnan julkaisusarja 31/2018.

Vilkka, H., Saarela, M. & Eskola, J. 2018. Riittääkö yksi? Tapaustutkimus kuvaajana ja selittäjänä. In: Valli, R. (ed.) Ikkunoita tutkimusmetodeihin. 5th revised edition. Jyväskylä: PS-Kustannus, 190-201.

Walton, J., Hoerr, S., Heine, L., Frost, S., Roisen, D. & Berkimer, M. 1999. Physical Activity and Stages of Change in Fifth and Sixth Graders. Journal of School Health 69 (7), 285-9.

Weber, E. U., Blais, A.-R. & Betz, N. E. 2002. A Domain-specific Risk-attitude Scale: Measuring Risk Perceptions and Risk Behaviors. Journal of Behavioral Decision Making 15 (4), 263-290.

Wheaton, B., Muthén, B., Alwin, D. F. & Summers, G. F. 1977. Assessing Reliability and Stability in Panel Models. Sociological Methodology 8, 84-136.

Wood, W. & Neal, D. T. 2009. The habitual consumer. Journal of Consumer Psychology 19 (4), 579-592.

Wulf, G., Freitas, H. E. & Tandy, R. T. 2014. Choosing to exercise more: Small choices increase exercise engagement. Psychology of Sport and Exercise 15 (3), 268-271.

Zhang, L. & Rashad, I. 2008. Obesity and Time Preference: The Health Consequences of Discounting the Future. Journal of Biosocial Science 40 (1), 97-113.

Zumbo, B. D. & Ochieng, C. O. 2002. The Effects of Various Configurations of Likert, Ordered Categorical, or Rating Scale Data on the Ordinal Logistic Regression Pseudo R-squared Measure of Fit: The case of the cumulative logit model. In: New Orleans, the United States: American Educational Research Association conference, April 2002.

Electronic sources

Agresti, A. 2012. Categorical Data Analysis. New Jerseys: John Wiley & Sons. Book from ProQuest Ebook Central. Accessed 22 January 2019. https://ebookcentral.proquest.com/lib/laurea/home.action

Beaumont, R. 2018. An Introduction to Regression Modelling using Structural Equation Modelling (SEM). Accessed 21 March 2019. http://www.floppybunny.org/robin/web/rbook/sem/regression_sem_2018b.pdf

Business Information System. 2018. Suomen Telecenter Oy. Accessed 6 September 2018. http://bit.ly/2NGcb7o

Cocina, L. 2014. Risk attitude & Economics. Les Regards 2014-01, 1-37. Accessed 11 June 2019. https://www.foncsi.org/en/publications/collections/viewpoints/risk-attitude-economics

Dayton, C. M. 2014. Are p-values and significance tests still meaningful in census data analysis? ResearchGate. Accessed 8 June 2019. http://bit.ly/2Jutblh

Finnish National Board on Research Integrity. 2012. Responsible conduct of research and procedures for handling allegations of misconduct in Finland. Accessed 10 June 2019. https://www.tenk.fi/sites/tenk.fi/files/HTK_ohje_2012.pdf

Fuller, W. A. 2009. Sampling Statistics. New Jersey: John Wiley & Sons. Accessed 4 April 2019. https://ebookcentral.proquest.com/lib/laurea/home.action

Gros, F. 2014. A Philosophy of Walking. Translated by John Howe. London & New York: Verso. Accessed 24 June 2019. https://www.versobooks.com/books/1865-a-philosophy-of-walking

Hanneman, R., Kposowa, A. J. & Riddle, M. D. 2013. Basic Statistics for Social Research. New Jersey: John Wiley & Sons. Book from ProQuest Ebook Central. Accessed 14 December 2018. https://ebookcentral.proquest.com/lib/laurea/home.action

Hosmer, D. W., Jr., Lemeshow, S. & Sturdivant, R. X. 2013. Applied Logistic Regression. Third Edition. New Jersey: John Wiley & Sons. Book from ProQuest Ebook Central. Accessed 21 January 2019. https://ebookcentral.proquest.com/lib/laurea/home.action

Jones, K. 2014. Are p-values and significance tests still meaningful in census data analysis? ResearchGate. Accessed 8 June 2019. http://bit.ly/2Jutblh

King, S. 2013. Guidelines for Referencing. Laurea University of Applied Sciences. 08 April 2013. Accessed 10 June. https://laureauas.sharepoint.com/sites/linkfi/Dokumentit/Guidelines%20for%20referencing.pdf#search=sebastian%20king

Kline, R. B. 2011. Principles and Practice of Structural Equation Modeling. 3rd Edition. New York: The Guilford Press. Accessed 21 March 2019. ftp://158.208.129.61/suzuki/PP_SEM_3e.pdf

McCormick, K., Salcedo, J. & Poh, A. 2015. SPSS Statistics for Dummies. Third edition. New Jersey: John Wiley & Sons. Book from ProQuest Ebook Central. Accessed 26 January 2019. https://ebookcentral.proquest.com/lib/laurea/home.action

National Advisory Board on Research Ethics. 2009. Ethical principles of research in the humanities and social and behavioural sciences and proposals for ethical review. Accessed 10 June 2019. https://www.tenk.fi/sites/tenk.fi/files/ethicalprinciples.pdf

Rectors' Conference of Finnish Universities of Applied Sciences Arene. 2018. Ethical guidelines for thesis work - checklists for students and supervisors. Accessed 10 June 2019. http://bit.ly/32hMs8h

Sreejesh, S., Mohapatra, S. & Anusree, M. R. 2014. Business Research. An Applied Orientation. New York: Springer Publishing Company. Accessed 6 May 2019. https://ebookcentral.proquest.com/lib/laurea/home.action

Thesis Guidelines for University of Applied Sciences Master's degrees. 2019. Laurea University of Applied Sciences. March 15, 2019. Accessed 10 June 2019. https://laureauas.sharepoint.com/sites/linken/Documents/YAMK_ONT_%20ohje_28-5-2019k-en.pdf

Tourangeau, R. & Plewes, T. J. (eds.) 2013. Nonresponse in Social Science Surveys. A Research Agenda. Washington D. C.: The National Academies Press. Accessed 4 April 2019. https://ebookcentral.proquest.com/lib/laurea/home.action

UCLA. 2019a. IDRE - Institute for Digital Research and Education. How Do I Interpret Odds Ration in Logistic Regression? SPSS FAQ. Accessed 11 January 2019. https://stats.idre.ucla.edu/spss/faq/how-do-i-interpret-odds-ratios-in-logistic-regression/

UCLA. 2019b. IDRE - Institute for Digital Research and Education. Introduction to Regression with SPSS Lesson 2 SPSS Regression Diagnostics. Accessed 29 January 2019. https://stats.idre.ucla.edu/spss/seminars/introduction-to-regression-with-spss/introreg-lesson2/

UKK Institute. 2018. Physical Activity Pie. Accessed 17 December 2018. http://www.ukkinstituutti.fi/en/products-services/physical_activity_pie

Washington, S. P., Karlaftis, M. G. & Mannering, F. L. 2011. Statistical and Econometric Methods for Transportation Data Analysis. 2nd edition. Boca Raton: CRC Press. Ebook. Accessed 11 February 2019. http://bit.ly/2LE3WWN

World Health Organization. 2018. Physical activity. Key facts. Accessed 17 December 2018. https://www.who.int/en/news-room/fact-sheets/detail/physical-activity

World Health Organization Regional Office for Europe. 2019. Body Mass Index - BMI. Accessed 10 January 2019. http://www.euro.who.int/en/health-topics/disease-prevention/nutrition/a-healthy-lifestyle/body-mass-index-bmi

Xiong, R., Findlay, C. & Meullenet, J.-F. 2008. Multivariate and Probabilistic Analyses of Sensory Science Problems. New Jersey: John Wiley & Sons. Book from ProQuest Ebook Central. Accessed 17 December 2018. https://ebookcentral.proquest.com/lib/laurea/home.action

Figures

Tables

Appendices

Appendix 1: Online survey (translated version from the Finnish original)

Section 1/7
Survey on Physical Activity 15.-21.6.2018

Hello!

Thank you for joining in a survey on physical activity. It will take 10-15 minutes to finish the survey.

Please, answer from your personal point of view. The answers will be utilized in a valuable research use, and they won't be traced to anyone personally.

In case of doubting a single question, please leave question unanswered.

Thank you for your time with this survey!

Survey creator: Laura Vainio / [university of applied sciences email] / [phone number]

Section 2/7
Background variables

1. Gender? ▫ Male. ▫ Female. ▫ Other.

2. Highest level of degree?

▫ Comprehensive school.

▫ Higher secondary school or vocational school.

▫ University of Applied Sciences.

▫ University.

▫ Other.

3. Age? (years) _____

4. Height? (centimeters) _____

5. Weight? (kilograms) _____

Section 3/7
Physical activity habits

Attention! The time scale and periods of time vary in different questions. Please pay attention.

Choose one alternative.

How often do you practice these physical activities on a weekly basis?

6. Moderate physical activity such as daily, incidental, or journey-to-work exercise, fast and lively play, walking and Nordic walking, cycling (less than 20 km/h), heavy household and garden work, berry-picking, fishing and hunting.	▫ Less than 15 min. ▫ Over 15 min but less than 1 h 15 min. ▫ Over 1 h 15 min but less than 2 h 30 min. ▫ Over 2 h 30 min but less than 3 h 45 min ▫ Over 3 h 45 min.
7. Vigorous physical activity such as cycling, running, cross-country skiing, racquet sports or ball games with running, Nordic, stair and uphill walking, fitness swimming, water running, aerobics.	▫ Less than 15 min. ▫ Over 15 min but less than 1 h 15 min. ▫ Over 1 h 15 min but less than 2 h 30 min. ▫ Over 2 h 30 min but less than 3 h 45 min ▫ Over 3 h 45 min.

How many times per week do you practice muscular endurance and motor skills supporting physical activity?

8. Muscular endurance and motor skills supporting physical activity such as fitness club, gym, circuit training, ball games, ice skating, stretching, balance training, dancing.	▫ 0 times. ▫ 1 time. ▫ 2 times. ▫ 3 times. ▫ At least 4 times.

For how long have you been engaging in your current regular physical activity?

9. Any regular physical activity that happens on a weekly basis.	▫ I don't engage in any regular physical activity currently. ▫ Less than 6 months. ▫ Over 6 months but less than 1 year. ▫ Over 1 year but less than 2 years. ▫ Over 2 years.

Section 4/7
Sedentary behaviour

Attention! The response unit is one day instead of a whole week.

How much sedentary time do you run up on a daily basis?

10. Sitting still, e.g. in the office during workday, at school, watching television or videos, in front of computer, at a vehicle, eating or having social time.	▫ Less than 2 h. ▫ Over 2 h but less than 4 h. ▫ Over 4 h but less than 6 h. ▫ Over 6 h but less than 8 h. ▫ Over 8 h.
11. Standing still, e.g. in the office during workday, at school, in front of computer, at the supermarket, at a vehicle or waiting.	▫ Less than 2 h. ▫ Over 2 h but less than 4 h. ▫ Over 4 h but less than 6 h. ▫ Over 6 h but less than 8 h. ▫ Over 8 h.
12. Lying down, e.g. in the bed or on a sofa.	▫ Less than 2 h. ▫ Over 2 h but less than 4 h. ▫ Over 4 h but less than 6 h.

▫ Over 6 h but less than 8 h.

▫ Over 8 h.

Section 5/7
Coin toss

Now, you will take part in an imaginary coin-toss.

13. You will take part in a coin-toss. Either outcome will occur on a 50-% risk. Which of these games will you choose?

Choose one option.

▫ Heads 40 € / tails 40 €.

▫ Heads 60 € / tails 30 €.

▫ Heads 80 € / tails 20 €.

▫ Heads 100 € / tails 10 €.

▫ Heads 120 € / tails 0 €.

▫ Heads 130 € / tails -10 €.

Section 6/7
Money now or after 6 months

Now, you will take part in an imaginary event, where you are handed out money.

14. You will be offered money. You will get an amount of money either now or after 6 months. Which one will you choose?

Choose the most suitable option on each row.

▫ 50 € now	▫ 51 € after 6 months.
▫ 50 € now	▫ 55 € after 6 months.
▫ 50 € now	▫ 60 € after 6 months.
▫ 50 € now	▫ 70 € after 6 months.
▫ 50 € now	▫ 100 € after 6 months.
▫ 50 € now	▫ 150 € after 6 months.

Section 7/7
Statements on physical activity

This is the final section.

Thank you so much on your time!

How is your current state of health?

15. How is your current state of health?	▫ Particularly poor. ▫ Rather poor. ▫ Neither poor nor good. ▫ Rather good. ▫ Particularly good.

How does the given statement support your thoughts of physical activity?

16. I engage in sufficient amount of physical activity on a weekly basis.	▫ Strongly disagree. ▫ Disagree. ▫ Neither disagree nor agree. ▫ Agree. ▫ Strongly agree.
17. I practice physical activities according to a precise weekly schedule.	▫ Strongly disagree. ▫ Disagree. ▫ Neither disagree nor agree. ▫ Agree. ▫ Strongly agree.
18. Practising physical activities decreases my other activities.	▫ Strongly disagree. ▫ Disagree. ▫ Neither disagree nor agree. ▫ Agree. ▫ Strongly agree.

19. Being physically active now doesn't guarantee me health after 25 years.

- ▫ Strongly disagree.
- ▫ Disagree.
- ▫ Neither disagree nor agree.
- ▫ Agree.
- ▫ Strongly agree.

20. My current amount of practising physical activities is good.

- ▫ Strongly disagree.
- ▫ Disagree.
- ▫ Neither disagree nor agree.
- ▫ Agree.
- ▫ Strongly agree.

21. I should be more physically active.

- ▫ Strongly disagree.
- ▫ Disagree.
- ▫ Neither disagree nor agree.
- ▫ Agree.
- ▫ Strongly agree.

22. Being physically active would require great amounts of food.

- ▫ Strongly disagree.
- ▫ Disagree.
- ▫ Neither disagree nor agree.
- ▫ Agree.
- ▫ Strongly agree.

23. I tend to stop practising physical activities after the first flush.

- ▫ Strongly disagree.
- ▫ Disagree.
- ▫ Neither disagree nor agree.

	▫ Agree.
	▫ Strongly agree.
24. Practising a physical activity takes me energy and time.	▫ Strongly disagree.
	▫ Disagree.
	▫ Neither disagree nor agree.
	▫ Agree.
	▫ Strongly agree.
25. I am physically active on a weekly basis.	▫ Strongly disagree.
	▫ Disagree.
	▫ Neither disagree nor agree.
	▫ Agree.
	▫ Strongly agree.
26. I wouldn't change anything in my weekly activity habits.	▫ Strongly disagree.
	▫ Disagree.
	▫ Neither disagree nor agree.
	▫ Agree.
	▫ Strongly agree.
27. Practising physical activities as a hobby decreases my spontaneous and informal physical activity.	▫ Strongly disagree.
	▫ Disagree.
	▫ Neither disagree nor agree.
	▫ Agree.
	▫ Strongly agree.
28. Being physically active wouldn't benefit my current life situation at all.	▫ Strongly disagree.

	▫ Disagree. ▫ Neither disagree nor agree. ▫ Agree. ▫ Strongly agree.
29. Being physically active doesn't guarantee me a better health.	▫ Strongly disagree. ▫ Disagree. ▫ Neither disagree nor agree. ▫ Agree. ▫ Strongly agree.
30. I tend to lie down on the couch after any form of physical activity.	▫ Strongly disagree. ▫ Disagree. ▫ Neither disagree nor agree. ▫ Agree. ▫ Strongly agree.
31. I practise physical activities on a weekly basis.	▫ Strongly disagree. ▫ Disagree. ▫ Neither disagree nor agree. ▫ Agree. ▫ Strongly agree.

Appendix 2: Background variable frequencies

This study had total 144 replies (N=144). 90 of the respondents (63 %) were male, 51 (35 %) were female and 3 (2 %) were other (N=144). Highest level of degree divided as follows: 13 (9 %) answered comprehensive school, 98 (68 %) higher secondary school or vocational school, 17 (12 %) university of applied sciences, 6 (4 %) university, and 9 (6 %) reported other highest level of degree (N=143).

Frequencies

Variable	N	Mean	Median	Mode	Std. dev.	Min.	Max.
1. Gender	144	0.40	0.00	0	0.532	0	2
2. Highest level of degree	143	1.30	1.00	1	0.927	0	4
3. Age	143	25.96	23.00	21	7.815	18	55
4. Height	142	175.89	179.00	180	9.766	155	198
5. Weight	141	80.39	78.00	75	18.688	45	147
* BMI, ungrouped	141	25.933	24.618	23.1	5.6575	16.9	55.3

*Manually calculated afterwards.

Appendix 3 Survey statement correlations

Correlations

		Q16 SQ	Q17 H	Q18 LA	Q19 IC	Q20 SQ	Q21 IC	Q22 LE	Q23 IC	Q24 LA	Q25 H	Q26 SQ	Q27 LE	Q28 IC	Q29 LA	Q30 LE	Q31 H
Q16 SQ	Pearson Cor.	1															
	Sig. (2-tailed)																
	N	143															
Q17 H	Pearson Cor.	0.765**	1														
	Sig. (2-tailed)	0.000															
	N	143	143														
Q18 LA	Pearson Cor.	-0.143	-0.174*	1													
	Sig. (2-tailed)	0.088	0.037														
	N	143	143	143													
Q19 IC	Pearson Cor.	-0.060	0.146	0.336**	1												
	Sig. (2-tailed)	0.481	0.083	0.000													
	N	141	141	141	141												
Q20 SQ	Pearson Cor.	0.730**	0.697**	-0.057	0.104	1											
	Sig. (2-tailed)	0.000	0.000	0.500	0.222												
	N	143	143	143	141	143											
Q21 IC	Pearson Cor.	-0.582**	-0.555**	0.068	-0.107	-0.722**	1										
	Sig. (2-tailed)	0.000	0.000	0.422	0.208	0.000											
	N	143	143	143	141	143	143										
Q22 LE	Pearson Cor.	0.045	0.160	0.124	0.112	0.187*	-0.054	1									
	Sig. (2-tailed)	0.592	0.057	0.140	0.184	0.026	0.523										
	N	143	143	143	141	143	143	143									
Q23 IC	Pearson Cor.	-0.569**	-0.417**	0.150	0.048	-0.539**	0.535**	0.053	1								
	Sig. (2-tailed)	0.000	0.000	0.075	0.575	0.000	0.000	0.531									
	N	142	142	142	140	142	142	142	142								
Q24 LA	Pearson Cor.	-0.140	-0.033	0.334**	0.230**	0.022	-0.002	0.195*	0.066	1							
	Sig. (2-tailed)	0.095	0.694	0.000	0.006	0.797	0.984	0.020	0.434								
	N	143	143	143	141	143	143	143	142	143							

Q25 H	Pearson Cor.	0.750**	0.658**	-0.203*	-0.007	0.606**	-0.489**	-0.039	-0.521**	-0.125	1						
	Sig. (2-tailed)	0.000	0.000	0.015	0.932	0.000	0.000	0.648	0.000	0.136							
	N	143	143	143	141	143	143	143	142	143	143						
Q26 SQ	Pearson Cor.	0.492**	0.556**	0.075	0.160	0.635**	-0.606**	0.125	-0.321**	0.071	0.470**	1					
	Sig. (2-tailed)	0.000	0.000	0.377	0.059	0.000	0.000	0.138	0.000	0.398	0.000						
	N	142	142	142	140	142	142	142	141	142	142	142					
Q27 LE	Pearson Cor.	0.121	0.166*	0.187*	0.122	0.290**	-0.206*	0.272**	-0.056	0.123	0.109	0.250**	1				
	Sig. (2-tailed)	0.155	0.049	0.026	0.151	0.000	0.014	0.001	0.513	0.148	0.198	0.003					
	N	141	141	141	139	141	141	141	140	141	141	140	141				
Q28 IC	Pearson Cor.	-0.011	0.034	0.370**	0.506**	0.150	-0.115	0.219**	0.158	0.120	-0.044	0.260**	0.278**	1			
	Sig. (2-tailed)	0.895	0.684	0.000	0.000	0.074	0.170	0.009	0.061	0.153	0.598	0.002	0.001				
	N	143	143	143	141	143	143	143	142	143	143	142	141	143			
Q29 LA	Pearson Cor.	-0.073	-0.035	0.459**	0.405**	0.158	-0.115	0.103	0.137	0.168*	-0.088	0.258**	0.297**	0.631**	1		
	Sig. (2-tailed)	0.390	0.677	0.000	0.000	0.062	0.176	0.225	0.106	0.047	0.298	0.002	0.000	0.000			
	N	141	141	141	139	141	141	141	140	141	141	140	139	141	141		
Q30 LE	Pearson Cor.	-0.254**	-0.092	0.236**	0.225**	-0.109	0.134	0.119	0.261**	0.097	-0.380**	-0.131	0.071	0.138	0.100	1	
	Sig. (2-tailed)	0.002	0.272	0.005	0.007	0.196	0.110	0.159	0.002	0.249	0.000	0.120	0.402	0.101	0.237		
	N	143	143	143	141	143	143	143	142	143	143	142	141	143	141	143	
Q31 H	Pearson Cor.	0.793**	0.663**	-0.183*	-0.030	0.618**	-0.473**	-0.061	-0.511**	-0.131	0.830**	0.372**	0.050	-0.092	-0.130	-0.312**	1
	Sig. (2-tailed)	0.000	0.000	0.028	0.725	0.000	0.000	0.467	0.000	0.119	0.000	0.000	0.560	0.273	0.125	0.000	
	N	143	143	143	141	143	143	143	142	143	143	142	141	143	141	143	143

*. Correlation is significant at the p<0.05 level (2-tailed).

**. Correlation is significant at the p<0.01 level (2-tailed).

Appendix 4: Reliability test, Item-Total Statistics

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correla-tion	Cronbach's Alpha if Item De-leted
Gender	64.82	197.849	-0.161	0.791
Highest level of degree	63.88	199.128	-0.155	0.796
BMI, grouped	62.48	196.882	-0.073	0.794
Moderate PA	62.67	183.403	0.356	0.779
Vigorous PA	63.4	176.257	0.499	0.772
Muscular endurance and motor skills supporting PA weekly	63.14	179.728	0.485	0.774
Length of engaging in regular PA	63.02	177.047	0.360	0.778
PASC	62.91	178.054	0.609	0.770
Sitting still daily	62.04	195.313	-0.008	0.791
Standing still daily	64.23	192.712	0.068	0.790
Lying down daily	63.9	189.856	0.102	0.791
Sedentary behaviour	63.39	191.122	0.202	0.785
Risk preference	64.12	191.490	0.167	0.786
Time 50 or 51	64.23	195.456	0.061	0.787
Time 50 or 55	64.28	196.141	-0.050	0.788
Time 50 or 60	64.34	195.660	0.004	0.788
Time 50 or 70	64.48	195.890	-0.021	0.789
Time 50 or 100.	64.78	196.031	-0.032	0.789
Time 50 or 150	65.11	194.791	0.122	0.787
Time preference	63.52	195.543	0.000	0.789
Perceived health	62.27	186.039	0.375	0.779
I engage in sufficient amount of PA on a weekly basis (SQ).	63.09	169.591	0.648	0.763
I practice PA according to a precise weekly schedule (H).	63.74	169.894	0.692	0.762
Practicing PA decreases my other activities (LA).	63.95	187.312	0.228	0.784
Being physically active now doesn't guarantee me health after 25 years (IT).	64.08	184.529	0.296	0.781
My current amount of practicing PAs is good (SQ).	63.39	170.508	0.665	0.763
I should be more physically active (IT).	62.63	216.315	-0.579	0.818
Being physically active would require great amounts of food (LE).	63.66	188.587	0.222	0.784
I tend to stop practicing PAs after the first flush (IT).	63.85	207.608	-0.379	0.808
Practicing PA on a weekly basis takes me energy and time (LA).	63.59	192.308	0.063	0.791
I am physically active on a weekly basis (H).	62.68	174.204	0.567	0.768
I wouldn't change anything in my weekly activity habits (SQ).	63.77	178.37	0.534	0.772
Practicing PAs as a hobby decreases my spontaneous and informal physical activity (LE).	63.92	185.632	0.337	0.780
Being physically active wouldn't benefit my current life situation at all (IT).	64.54	187.132	0.324	0.781
Being physically active doesn't guarantee me a better health (LA).	64.59	189.015	0.262	0.783
I tend to lie down on the couch after any form of PA (LE).	63.67	194.899	-0.007	0.792
I practise PAs on a weekly basis (H).	62.54	173.542	0.570	0.768
Sum SQ	63.38	171.750	0.718	0.763
Sum H	62.98	172.779	0.655	0.765
Sum LA	64.05	187.359	0.299	0.782
Sum IC	64.12	183.915	0.406	0.778
Sum LE	63.77	188.838	0.323	0.782

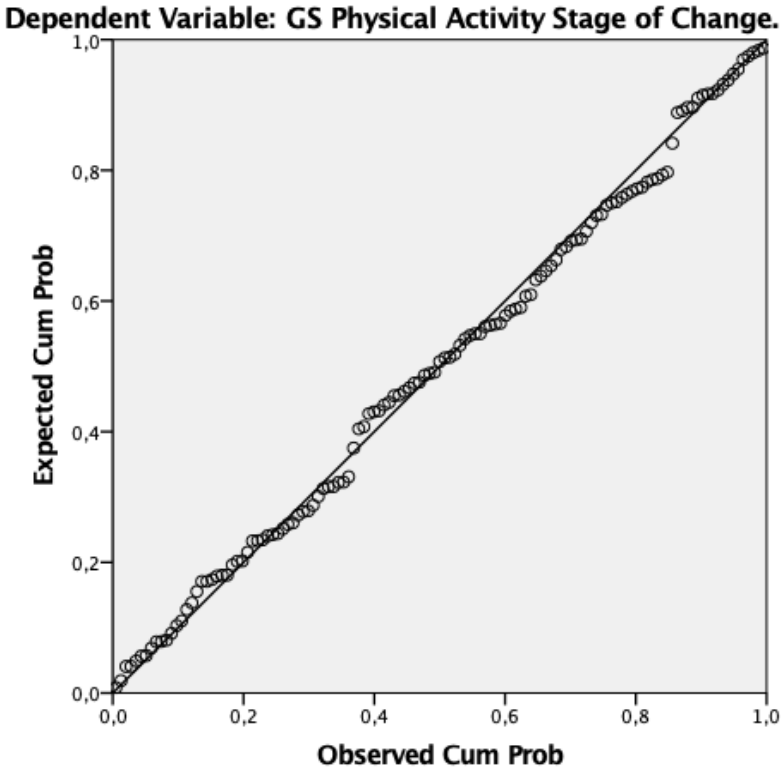
Appendix 5: Variables summary table categorized by PASC

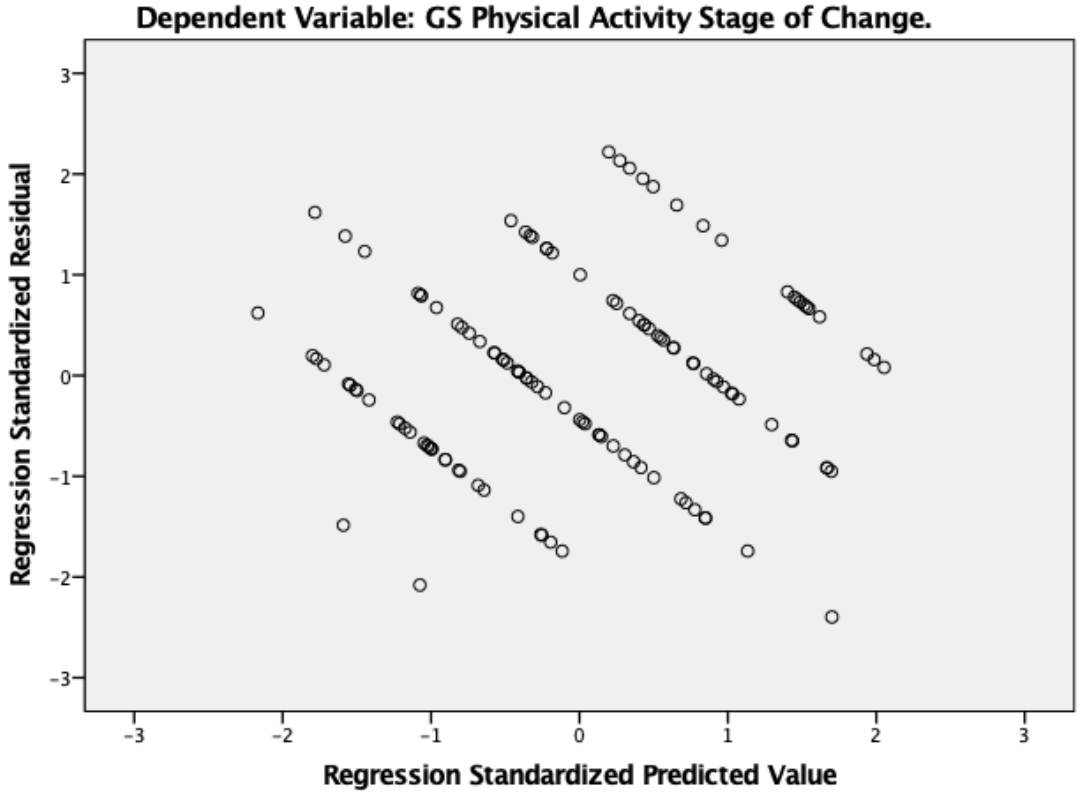
Physical Activity Stages of Change

	Precontemplation		Contemplation		Preparation		Action		Maintenance	
Gender	N	%	N	%	N	%	N	%	N	%
Male	3	2.14 %	17	12.14 %	28	20.00 %	26	18.57 %	13	9.29 %
Female	0	0.00 %	16	11.43 %	15	10.71 %	12	8.57 %	7	5.00 %
Other	0	0.00 %	0	0.00 %	2	1.43 %	1	0.71 %	0	0.00 %
Degree										
Compr.school	0	0.00 %	5	3.60 %	4	2.88 %	3	2.16 %	1	0.72 %
High/voc.	3	2.16 %	21	15.11 %	32	23.02 %	25	17.99 %	14	10.07 %
UAS	0	0.00 %	4	2.88 %	4	2.88 %	6	4.32 %	2	1.44 %
University	0	0.00 %	0	0.00 %	1	0.72 %	2	1.44 %	3	2.16 %
Other	0	0.00 %	3	2.16 %	4	2.88 %	2	1.44 %	0	0.00 %
Age (mean)		24		25		26		28		25
BMI										
Underweight	0	0.00 %	1	0.72 %	0	0.00 %	0	0.00 %	1	0.72 %
Normal weight	1	0.72 %	16	11.59 %	23	16.67 %	20	14.49 %	11	7.97 %
Pre-obesity	2	1.45 %	8	5.80 %	11	7.97 %	13	9.42 %	7	5.07 %
Obesity class I	0	0.00 %	6	4.35 %	4	2.90 %	4	2.90 %	1	0.72 %
Obesity class II	0	0.00 %	0	0.00 %	5	3.62 %	0	0.00 %	0	0.00 %
Obesity class III	0	0.00 %	1	0.72 %	2	1.45 %	1	0.72 %	0	0.00 %
Sedentary										
2hrs<x<4hrs	1	0.71 %	10	7.14 %	13	9.29 %	16	11.43 %	10	7.14 %
4hrs<x<6hrs	1	0.71 %	20	14.29 %	20	14.29 %	20	14.29 %	7	5.00 %
6hrs<x<8hrs	1	0.71 %	3	2.14 %	10	7.14 %	3	2.14 %	3	2.14 %
>8hrs	0	0.00 %	0	0.00 %	2	1.43 %	0	0.00 %	0	0.00 %
Risk										
40/40	0	0.00 %	8	5.71 %	13	9.29 %	11	7.86 %	5	3.57 %
60/30	1	0.71 %	4	2.86 %	5	3.57 %	7	5.00 %	2	1.43 %
80/20	1	0.71 %	4	2.86 %	7	5.00 %	5	3.57 %	3	2.14 %
100/10	0	0.00 %	2	1.43 %	3	2.14 %	5	3.57 %	1	0.71 %
120/0	1	0.71 %	7	5.00 %	10	7.14 %	8	5.71 %	6	4.29 %
130/-10	0	0.00 %	8	5.71 %	7	5.00 %	3	2.14 %	3	2.14 %
Time										
0	0	0.00 %	2	1.43 %	1	0.71 %	2	1.43 %	0	0.00 %
1	0	0.00 %	0	0.00 %	1	0.71 %	3	2.14 %	1	0.71 %
2	0	0.00 %	1	0.71 %	3	2.14 %	4	2.86 %	2	1.43 %
3	0	0.00 %	3	2.14 %	7	5.00 %	7	5.00 %	4	2.86 %
4	3	2.14 %	11	7.86 %	13	9.29 %	13	9.29 %	4	2.86 %
5	0	0.00 %	12	8.57 %	17	12.14 %	7	5.00 %	8	5.71 %
6	0	0.00 %	4	2.86 %	3	2.14 %	3	2.14 %	1	0.71 %
Health										
Part.poor	0	0.00 %	1	0.72 %	0	0.00 %	0	0.00 %	0	0.00 %
Rather poor	0	0.00 %	6	4.32 %	3	2.16 %	1	0.72 %	0	0.00 %

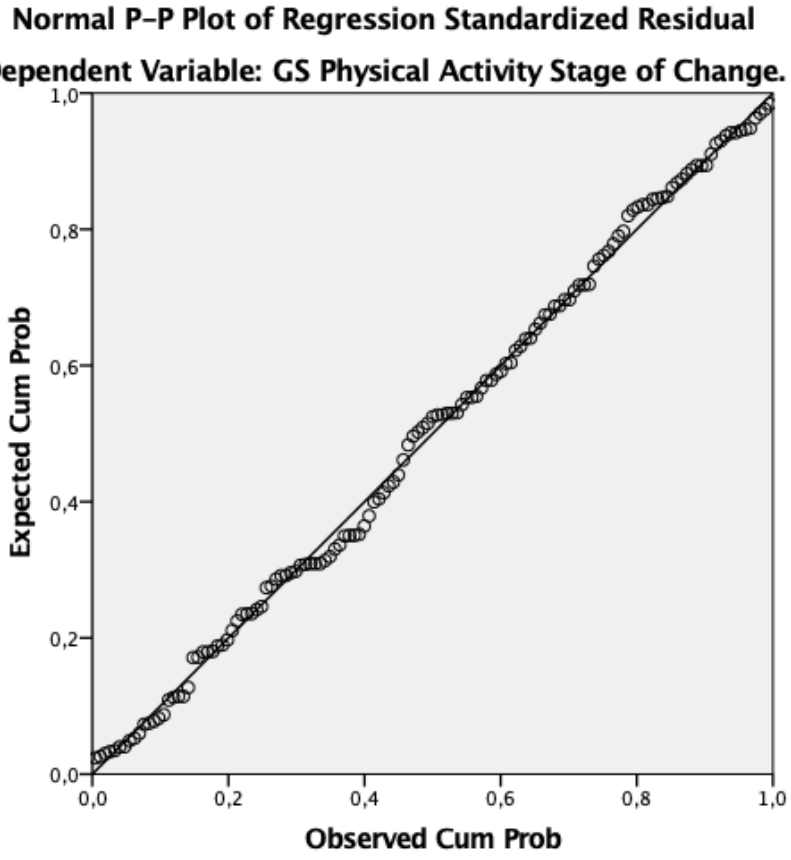
Neither nor	3	2.16 %	7	5.04 %	8	5.76 %	3	2.16 %	2	1.44 %
Rather good	0	0.00 %	16	11.51 %	24	17.27 %	21	15.11 %	7	5.04 %
Part.good	0	0.00 %	3	2.16 %	9	6.47 %	14	10.07 %	11	7.91 %
SQ										
Strong.disagree	2	1.44 %	11	7.91 %	6	4.32 %	0	0.00 %	0	0.00 %
Disagree	1	0.72 %	13	9.35 %	21	15.11 %	5	3.60 %	0	0.00 %
Neither nor	0	0.00 %	7	5.04 %	9	6.47 %	18	12.95 %	4	2.88 %
Agree	0	0.00 %	1	0.72 %	7	5.04 %	11	7.91 %	9	6.47 %
Strong.agree	0	0.00 %	0	0.00 %	2	1.44 %	5	3.60 %	7	5.04 %
H										
Strong.disagree	2	1.43 %	11	7.86 %	2	1.43 %	0	0.00 %	0	0.00 %
Disagree	1	0.71 %	15	10.71 %	12	8.57 %	1	0.71 %	0	0.00 %
Neither nor	0	0.00 %	6	4.29 %	15	10.71 %	11	7.86 %	1	0.71 %
Agree	0	0.00 %	1	0.71 %	11	7.86 %	17	12.14 %	7	5.00 %
Strong.agree	0	0.00 %	0	0.00 %	5	3.57 %	10	7.14 %	12	8.57 %
LA										
Strong.disagree	2	1.45 %	8	5.80 %	9	6.52 %	6	4.35 %	9	6.52 %
Disagree	0	0.00 %	11	7.97 %	21	15.22 %	24	17.39 %	8	5.80 %
Neither nor	0	0.00 %	8	5.80 %	12	8.70 %	6	4.35 %	3	2.17 %
Agree	1	0.72 %	3	2.17 %	3	2.17 %	1	0.72 %	0	0.00 %
Strong.agree	0	0.00 %	2	1.45 %	0	0.00 %	1	0.72 %	0	0.00 %
IC										
Strong.disagree	2	1.45 %	10	7.25 %	15	10.87 %	14	10.14 %	6	4.35 %
Disagree	0	0.00 %	12	8.70 %	14	10.14 %	14	10.14 %	8	5.80 %
Neither nor	1	0.72 %	6	4.35 %	11	7.97 %	9	6.52 %	4	2.90 %
Agree	0	0.00 %	4	2.90 %	4	2.90 %	1	0.72 %	0	0.00 %
Strong.agree	0	0.00 %	1	0.72 %	1	0.72 %	0	0.00 %	1	0.72 %
LE										
Strong.disagree	0	0.00 %	3	2.17 %	3	2.17 %	2	1.45 %	2	1.45 %
Disagree	0	0.00 %	16	11.59 %	25	18.12 %	20	14.49 %	7	5.07 %
Neither nor	1	0.72 %	11	7.97 %	14	10.14 %	16	11.59 %	10	7.25 %
Agree	1	0.72 %	3	2.17 %	2	1.45 %	1	0.72 %	1	0.72 %

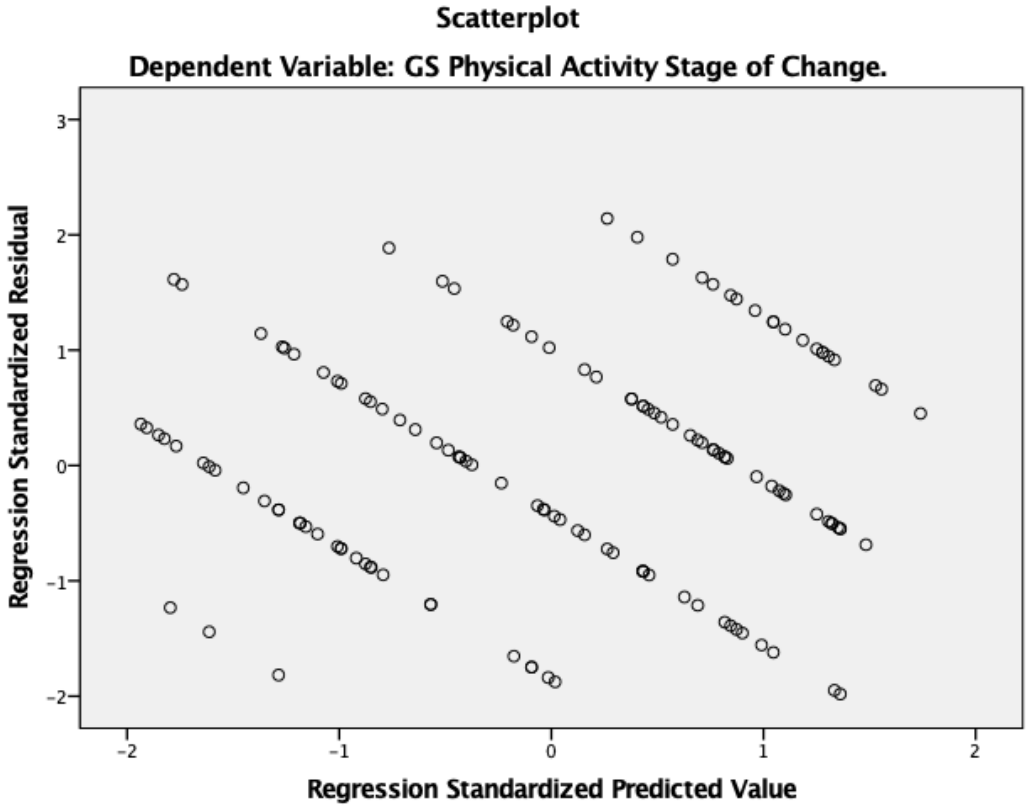
Appendix 6: P-P plot and scatterplot of the residual distribution





Appendix 7: Results of dummy coding variables: age, SQ and, H





Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	H4, Age, SQ2, H1, SsQ0, H2, SQ3, H0, SQ4[b]	.	Enter

a. Dependent Variable: PASC.

b. Tolerance = 0.000 limit reached.

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.764[a]	0.584	0.554	0.698

a. Predictors: (Constant), H4, Age, SQ2, H1, SQ0, H2, SQ3, H0, SQ4

b. Dependent Variable: PASC.

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	88.058	9	9.784	20.083	0.000[b]
	Residual	62.849	129	0.487		
	Total	150.906	138			

a. Dependent Variable: PASC.

b. Predictors: (Constant), H4, Age, SQ2, H1, SQ0, H2, SQ3, H0, SQ4

Coefficients[a]

Model		Unst. coefficients		St. coefficients	t	Sig.	95 % CI for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	1.840	0.300		6.127	0.000	1.246	2.434
	Age.	0.220	0.008	0.165	2.823	0.006	0.007	0.038
	SQ0	-0.125	0.214	-0.041	-0.581	0.562	-0.549	0.300
	SQ2	0.336	0.179	0.144	1.871	0.064	-0.019	0.690
	SQ3	0.642	0.225	0.247	2.857	0.005	0.198	1.087
	SQ4	0.850	0.319	0.246	2.664	0.009	0.219	1.481
	H0	-1.387	0.269	-0.413	-5.149	0.000	-1.920	-0.854
	H1	-0.979	0.216	-0.377	-4.524	0.000	-1.408	-0.551
	H2	-0.420	0.185	-0.172	-2.272	0.025	-0.786	-0.054
	H4	0.183	0.218	0.070	0.841	0.402	-0.248	0.614

a. Dependent Variable: PASC.

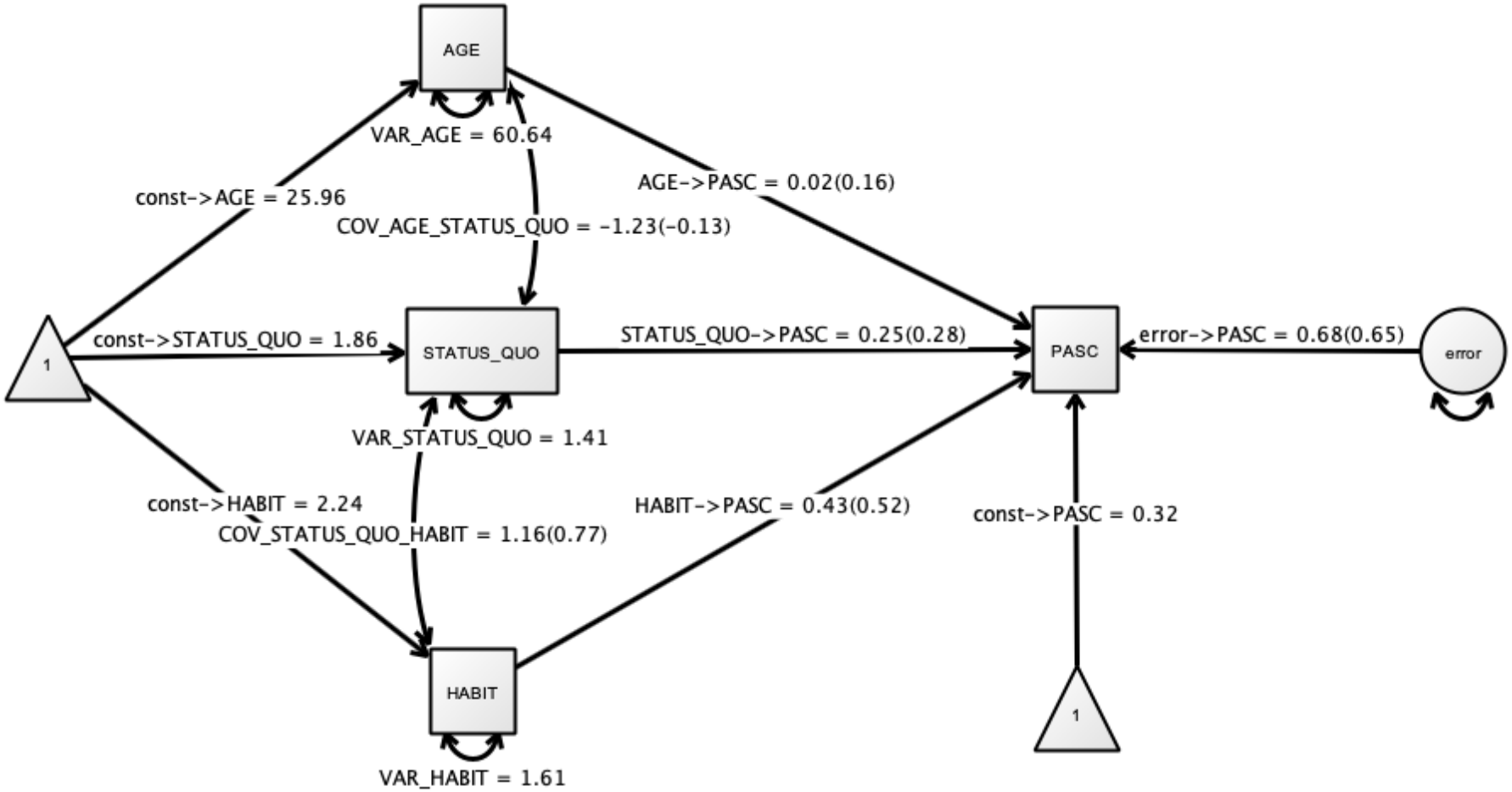
Excluded Variables[a]

Model		Beta In	t	Sig.	Partial Correlation	Collinearity Statistics
						Tolerance
1	SQ1	.[b]	.	.	.	0
	H3	.[b]	.	.	.	0

a. Dependent Variable: PASC.

b. Predictors in the Model: (Constant), H4, Age, SQ2, H1, SQ0, H2, SQ3, H0, SQ4

Appendix 8: A larger version of the SEM model



Appendix 9: Frequencies table and correlation matrix of the final model

Estimate Summary

	Age	PASC	SQ	H
Min.	18	0	0	0
1st qu.	21	1	1	1
Median	23	2	2	2
Mean	25.95804	2.28571	1.87324	2.24476
3rd qu.	29	3	3	3
Max.	55	4	4	4
Stdv.	7.81464	1.04768	1.202	1.27388
Total.	143	143	143	143
Missing.	0	3	1	0

Correlations

		Age	PASC	SQ	H
Age	Pearson Cor.	1			
	Sig. (2-tailed)				
	N	143			
PASC	Pearson Cor.	0.062	1		
	Sig. (2-tailed)	0.465			
	N	140	140		
SQ	Pearson Cor.	-0.197*	0.653**	1	
	Sig. (2-tailed)	0.018	0.000		
	N	142	139	142	
H	Pearson Cor.	0-.099	0.728**	0.771**	1
	Sig. (2-tailed)	0.241	0.000	0.000	
	N	143	140	142	143

*. Correlation is significant at the p<0.05 level (2-tailed).

**. Correlation is significant at the p<0.01 level (2-tailed).